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REGISTER, 1933-1934

ANNOUNCEMENT, 1934-35

BETHLEHEM
PENNSYLVANIA

1933

JULY

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1934

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UNIVERSITY CALENDAR

1933–1934

1933

Sept. 7, 8, 9, 11 (Thurs.-Mon.)	Examinations for admission
Sept. 11, 3:00 p.m. (Mon.)	First faculty meeting
Sept. 12, 13, 14, 15, 16 (Tues.-Sat.)	Freshman Week
Sept. 12, 13, 14, 15, 16 (Tues.-Sat.)	Fall re-examinations
Sept. 18, 19, 20 (Mon., Tues., Wed.)	Undergraduate registration
Sept. 21, 7:45 a.m. (Thurs.)	**First Semester begins**
Sept. 23 (Sat.)	Graduate registration
Sept. 25 (Mon.)	Last day for filing applications for degrees to be conferred on Founder's Day
Oct. 2 (Mon.)	Last day for undergraduate registration
Oct. 4 (Wed.)	Founder's Day (holiday)
Oct. 14 (Sat.)	Last day for graduate registration
Nov. 9 (Thurs.)	Mid-semester reports
Nov. 29, 4:00 p.m. (Wed.)	Thanksgiving holidays begin
Dec. 4, 7:45 a.m. (Mon.)	Thanksgiving holidays end
Dec. 20, 4:00 p.m. (Wed.)	Christmas holidays begin

1934

Jan. 4, 7:45 a.m. (Thurs.)	Christmas holidays end
Jan. 17, 12:00 m. (Wed.)	Instruction ends
Jan. 18, 8:00 a.m. (Thurs.)	Examinations begin
Jan. 27, 6:00 p.m. (Sat.)	Examinations end
Jan. 30, 31 (Tues., Wed.)	Undergraduate registration
Feb. 1, 7:45 a.m. (Thurs.)	**Second Semester begins**
Feb. 3 (Sat.)	Graduate registration
Feb. 12 (Mon.)	Last day for undergraduate registration
Feb. 24 (Sat.)	Last day for graduate registration
Mar. 23 (Fri.)	Mid-semester reports
Mar. 29, 7:45 a.m. (Thurs.)	Easter holidays begin
Apr. 5, 7:45 a.m. (Thurs.)	Easter holidays end
May 15 (Tues.)	Last day for filing applications for degrees to be conferred on University Day
May 21, 22, 23 (Mon., Tues., Wed.)	Senior Arts comprehensive examinations
May 23, 12:00 m. (Wed.)	Instruction ends
May 24, 8:00 a.m. (Thurs.)	Examinations begin
June 2, 6:00 p.m. (Sat.)	Examinations end
June 4 (Mon.)	Summer engineering courses begin
June 7, 8 (Thurs., Fri.)	Senior re-examinations
June 9 (Sat.)	Alumni Day
June 10 (Sun.)	Baccalaureate Sunday
June 11 (Mon.)	Class Day
June 12 (Tues.)	University Day
June 13, 14, 15, 16 (Wed.-Sat.)	Examinations for admission
June 30 (Sat.)	Summer engineering courses end
July 2 (Mon.)	Summer session begins
July 2 (Mon.)	Second surveying camp begins
July 14 (Sat.)	Second surveying camp ends
Aug. 11 (Sat.)	Summer session ends

UNIVERSITY CALENDAR—Continued

1934–1935

1934

Sept. 6, 7, 8, 10 (Thurs.-Mon.)	Examinations for admission
Sept. 10, 3:00 p.m. (Mon.)	First faculty meeting
Sept. 11, 12, 13, 14, 15 (Tues.-Sat.)	Freshman Week
Sept. 11, 12, 13, 14, 15 (Tues.-Sat.)	Fall re-examinations
Sept. 17, 18, 19 (Mon., Tues., Wed.)	Undergraduate registration
Sept. 20, 7:45 a.m. (Thurs.)	**First Semester begins**
Sept. 20, 21, 22 (Thurs., Fri., Sat.)	Graduate registration
Sept. 25 (Tues.)	Last day for filing applications for degrees to be conferred on Founder's Day
Oct. 1 (Mon.)	Last day for registration
Oct. 3 (Wed.)	Founder's Day (holiday)
Nov. 8 (Thurs.)	Mid-semester reports
Nov. 28, 4:00 p.m. (Wed.)	Thanksgiving holidays begin
Dec. 3, 7:45 a.m. (Mon.)	Thanksgiving holidays end
Dec. 20, 7:45 a.m. (Thurs.)	Christmas holidays begin

1935

Jan. 3, 7:45 a.m. (Thurs.)	Christmas holidays end
Jan. 16, 12:00 m. (Wed.)	Instruction ends
Jan. 17, 8:00 a.m. (Thurs.)	Examinations begin
Jan. 26, 6:00 p.m. (Sat.)	Examinations end
Jan. 29, 30 (Tues., Wed.)	Undergraduate registration
Jan. 31, 7:45 a.m. (Thurs.)	**Second Semester begins**
Jan. 31, Feb. 1, 2 (Thurs., Fri., Sat.)	Graduate registration
Feb. 11 (Mon.)	Last day for registration
Mar. 22 (Fri.)	Mid-semester reports
Apr. 18, 7:45 a.m. (Thurs.)	Easter holidays begin
Apr. 25, 7:45 a.m. (Thurs.)	Easter holidays end
May 15 (Wed.)	Last day for filing applications for degrees to be conferred on University Day
May 20, 21, 22 (Mon., Tues., Wed.)	Senior Arts comprehensive examinations
May 22, 12:00 m. (Wed.)	Instruction ends
May 23, 8:00 a.m. (Thurs.)	Examinations begin
June 1, 6:00 p.m. (Sat.)	Examinations end
June 3 (Mon.)	Summer engineering courses begin
June 6, 7 (Thurs., Fri.)	Senior re-examinations
June 8 (Sat.)	Alumni Day
June 9 (Sun.)	Baccalaureate Sunday
June 10 (Mon.)	Class Day
June 11 (Tues.)	University Day

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Lecturer on Hydraulic Engineering and Water Supply

WILLIAM BOWIE, B.S., C.E., M.A., SC.D.
Lecturer on Isostasy and Geodesy

HENRY I. KLOPP, M.D.
Lecturer on Mental Hygiene

CHARLES AUSTIN BUCK, B.S. IN CHEM., ENG.D.
Lecturer on Procurement of Raw Materials

INSTRUCTORS

MORRIS EUGENE KANALY
Instructor in Physical Education

JUDSON GRAY SMULL, B.S., M.S.
Instructor in Chemistry

DAVID GALLUP SCOTT, B.A., M.A.
Instructor in Romance Languages

EUGENE HULSE SLOANE, B.A., M.A.
Instructor in English

JOHN ROBERT CONNELLY, B.S. IN M.E., M.S.
Instructor in Mechanical Engineering

GEORGE BOYD THOM, M.E., M.S.
Instructor in Mechanical Engineering

RICHARD JOHN DeGRAY, Ch.E., M.S.
Instructor in Chemistry

RALPH NEWCOMB VanARNAM, E.E., M.S.
Instructor in Mathematics and Astronomy

FRANK SWAN BEALE, B.S., M.S., Ph.D.
Instructor in Mathematics

EDWARD HUTCHINS CUTLER, A.B., A.M., Ph.D.
Instructor in Mathematics

SIMON DEPTULA, A.B., M.A.
Instructor in English

MAURICE EWING, B.A., M.A., Ph.D.
Instructor in Physics

WILLIAM HARRY FORMHALS, B.S. in E.E.
Instructor in Electrical Engineering

DANIEL HENRY HARRIS, A.B., M.A., Ph.D.
Instructor in Psychology

HENRY CARL IVAR KNUTSON, E.E., M.E.E.
Instructor in Electrical Engineering

THEODORE THOMAS LAFFERTY, A.B., M.A., Ph.D.
Instructor in Education

WILSON FRELS PAYNE, Ph.B., M.A.
Instructor in Economics

LAWRENCE WHITCOMB, Ph.B., A.M., Ph.D.
Instructor in Geology

FRANCIS JOHN TREMBLEY, B.S., M.S.
Instructor in Biology

DONALD McCOY FRASER, A.B., A.M., Ph.D.
Instructor in Geology

CEDRIC GALE, A.B., M.A.
Instructor in English

VORIS V. LATSHAW, B.A., A.M., PH.D.
Instructor in Mathematics

CHARLES WESLEY PHY, B.A., M.A.
Instructor in Journalism

BENJAMIN LICHTY SNAVELY, B.S. IN ENG. PHYS.
Instructor in Physics

ROBERT WALLACE MAYER, B.S., M.S., PH.D.
Instructor in Economics

ALBERT AUGUSTUS RIGHTS, A.B., A.M.
Instructor in English

PAUL ROBERT CULVERT, B.P.E.
Instructor in Physical Education

ASSISTANTS

JAMES MAHONEY
Assistant in Swimming

GEORGE FRANCIS GASDA, SERGT., D.E.M.L., U. S. A.
Assistant in Military Science and Tactics

CARES CREIGHTON KEYSER, C.E.
Laboratory Assistant in Civil Engineering

HENRY GEORGE SWAIN, A.B., M.A.
Assistant in Mathematics

ALBERT PADDOCK CRARY, B.S., M.S.
Graduate Asistant in Physics

KENNETH KARL KOST, B.A.
Assistant in English

LEO MARTIN O'BRIEN, TECHNICAL SERGT., D.E.M.L., U. S. A.
Assistant in Military Science and Tactics

THEODORE GEORGE EHRSAM, B.A., M.A.
Assistant in English

CLYDE ALBERT HARDING, B.A., M.A.
Assistant in English

EMERSON WERTZ KAUFMANN, B.S. IN CH.E.
Graduate Assistant in Chemistry

THOMAS H. DUBY, SERGT.. D.E.M.L., U. S. A.
Assistant in Military Science and Tactics

RESEARCH FELLOWS

ALFRED NATHAN ROGERS, B.S. IN CH.E., M.S.
Textile Foundation Fellow (to January 15, 1934)

JOHN DAVID BRANDNER, B.S. IN CH.E.
Student Chemistry Foundation Fellow

WILLIAM CHARLES FRITZ, B.S. IN CHEM.
Eavenson and Levering Company Research Fellow

CHARLES EVERARD JOSEPH GREEN, B.S. IN CH.E.
Hunt-Rankin Leather Company Research Fellow

BRUCE GILBERT JOHNSTON, B.S.
Lawrence Calvin Brink Research Fellow in Civil Engineering

MAX KANTOR, B.S. IN CH.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

PHILIP BENHAM MYERS, A.B.
Lehigh Institute of Research Fellow in Geology

HARRY BROOKS OSBORN, JR., B.S. IN CH.E.
H. M. Byllesby Research Fellow in Chemical Engineering

BENJAMIN RABINOWITZ, B.S. IN CH.E.
Lehigh Institute of Research Fellow in Chemistry

ALBERT MONFORTE THORNE, JR., B.S. IN ENG. PHYS.
Lehigh Institute of Research Fellow in Physics and Metallurgy

ARTHUR LEONARD BENSON, B.A.
Phi Gamma Delta Fraternity Tutorial Fellow

GEORGE MALCOLM DEWEES, B.S. IN CH.E.
Student Chemistry Foundation Fellow

FREDERICK PHILIP FISCHER, B.S. IN E.E.
H. M. Byllesby Research Fellow in Electrical Engineering

CHARLES MARCELLUS JACKSON, B.S. IN CH.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

PETER EDWARD KYLE, B.S. IN M.E.
James Ward Packard Research Fellow

JOHN LOUGH OVERHOLT, B.S. IN CH.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

FRED LEWIS RIGHTS, B.S. IN CH.E.
Lehigh Institute of Research Fellow in Bacteriology

EARL JAMES SERFASS, B.S. IN CH.E.
Hunt-Rankin Leather Company Research Fellow

WILLIAM EUGENE SOMERS, B.S. IN M.E.
C. Kemble Baldwin Research Fellow in Aeronautic Engineering

DOUGLAS MACMILLAN STEWART, A.B., B.S. IN C.E.
Garrett Linderman Hoppes Research Fellow in Civil Engineering

AXEL TAGE-NIELSEN, JR., B.S. IN CH.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

ROBERT SCOTT TAYLOR, B.S. IN CH.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

HUGH SKILLMAN TEN EYCK, B.S. IN MET.E.
New Jersey Zinc Company Research Fellow

NORMAN GEORGE SCHREINER, C.E.
American Welding Society Research Fellow

COMMITTEES OF THE FACULTY

(The term of each member expires in June of the year given in parenthesis after his name. The President is ex officio a member of all committees)

ADMISSIONS: Dean McConn (*ex officio*), Registrar Curtis (*ex officio*), Professors Fox (1934), More (1935), H. P. Thomas (1936), Smail (1937), Bayley (1938), Ford (1939), Hazlehurst (1940).

ADVANCED STANDING: Registrar Curtis (*ex officio*), Professors Babasinian (1934), Diefenderfer (1935), Luch (1936), S. J. Thomas (1937).

CHAPEL: Professors Beardslee (*ex officio*), Reynolds (1934), Hall (1935), Schulz (1936), Crum (1937), Payrow (1938).

DISCIPLINE: Dean McConn (*ex officio*), Professors Cowin (1934), Butterfield (1935), Hibshman (1936), and one student member: R. N. Lindabury.

EDUCATIONAL POLICY: Professors Carothers (1934), Palmer (1935), Sutherland (1936), Seyfert (1937), Ullmann (1938).

FACULTY EDUCATIONAL CLUB: Professors Ford, Gipson, Stuart, F. C. Becker, Kegel, Simmons.

HONORARY DEGREES: Professors B. L. Miller (1934), Ullmann (1935), Vice-President Emery (1936), Professors Stoughton (1937), F. V. Larkin (1938), Fort (1939).

HOUSE COMMITTEE, DROWN MEMORIAL HALL: Professor Beardslee and two student members: R. N. Lindabury, G. L. Wolcott.

INSPECTION TRIPS: Professors Anderson (1934), Hibshman (1935), Butts (1936), Sinkinson (1937), Jennings (1938).

PETITIONS: Dean McConn (*ex officio*), Registrar Curtis (*ex officio*), Professors Payrow (1934), Luce (1935), Shook (1936).

PUBLICATIONS, BOARD OF: Dean McConn (*ex officio*), Professors Jensen (1934), Smith (1935), and three student members: E. R. English, R. E. McLeod, W. R. Taylor.

ROSTER: Registrar Curtis (*ex officio*), Professors Cowin (1934), Harmon (1935), Doan (1936), Riley (1937).

STANDING OF STUDENTS: Dean McConn, Registrar Curtis, Professors Palmer, Carothers, Ullmann, Sutherland, Seyfert, Bidwell, F. V. Larkin, Stoughton, Eckfeldt (all members *ex officiis*).

STUDENT ACTIVITIES: Dean McConn (*ex officio*), Professors Diamond (1934), Beardslee (1935), and three student members: B. L. Bishop, J. K. Beidler, G. B. McMeans.

STUDENT CLUBS: Dean McConn (*ex officio*), Professors Anderson (1934), Butts (1935), and three student members: W. M. Jacobi, H. H. Demarest, J. R. Fugard.

SUMMER SESSION: Vice-President Emery (*ex officio*), Professors Smith (1934), Fuller (1935), Jennings (1936), Stocker (1937), Hughes (1938).

OFFICERS OF ADMINISTRATION

Office of the President

Charles Russ Richards, M.M.E., Eng.D., LL.D., *President*

Office of the Vice-President and Comptroller

Natt Morrill Emery, A.B., M.A., Litt.D., *Vice-President and Comptroller*

Frederick Ralph Ashbaugh, *Bursar and Purchasing Agent*

Melvin Schissler, C.P.A., *Bookkeeper*

Englebert Henry Baderschneider, M.E., *Manager of Supply Bureau*

Office of the Dean

Charles Maxwell McConn, B.A., M.A., Litt.D., *Dean*
George Bartlett Curtis, B.A., A.M., *Associate Dean*

Office of the Registrar

George Bartlett Curtis, B.A., A.M., *Registrar*
George Willis Ely, B.S. in Bus. Ad., *Assistant to the Registrar*
Jeanette Ida Cleaveland, *Recorder*

Directors of Curricula

Philip Mason Palmer, A.B., *Director of the College of Arts and Science*

Neil Carothers, B.A., Ph.D., *Director of the College of Business Administration*

Harry M. Ullmann, A.B., Ph.D., *Director of the Curricula in Chemistry and Chemical Engineering*

Hale Sutherland, A.B., S.B., *Director of the Curriculum in Civil Engineering*

Stanley Sylvester Seyfert, E.E., M.S., Sc.D., *Director of the Curriculum in Electrical Engineering*

Charles Clarence Bidwell, A.B., Ph.D., *Director of the Curriculum in Engineering Physics*

Fred Viall Larkin, B.S., M.E., *Director of the Curricula in Mechanical Engineering and Industrial Engineering*

BRADLEY STOUGHTON, PH.B., B.S., *Director of the Curriculum in Metallurgical Engineering*

HOWARD ECKFELDT, B.S., E.M., *Director of the Curriculum in Mining Engineering*

Summer Session

NATT MORRILL EMERY, A.B., M.A., LITT.D., *Director*

Faculty

GEORGE BARTLETT CURTIS, B.A., A.M.. *Secretary*

Legal Counsel

ROBERT SAYRE TAYLOR, B.S., *Legal Counsel*

Linderman Memorial Library

HOWARD SEAVOY LEACH, A.B., M.A., *Librarian*

MARY ELIZABETH WHEATLEY, A.B., A.M., *Head Cataloguer*

ELIZABETH BAER HAY, A.B., B.S. IN L.S., *Circulation Desk Attendant*

MYRTLE LAURA HELMS, A.B., *Assistant Desk Attendant*

MARGARET LARAMY MEAKER, B.A., B.S. *in* L.S., M.A., *First Assistant Cataloguer*

ISABEL ARDERY BOONE TREMBLEY, A.B., B.S. IN L.S., *Assistant Cataloguer*

ROBERT F. RILEY, *Clerk*

Packer Memorial Church

THE REV. CLAUDE GILLETTE BEARDSLEE, B.A., B.D., M.A., S.T.M., PH.D., *Chaplain*

THOMAS EDGAR SHIELDS, A.A.G.O., *Organist*

Students' Health Service

RAYMOND COOLEY BULL, B.S., A.B., M.D., *Director*

STEWART LEEDS RANKIN, B.S., M.D., *Assistant Director*

MRS. JENNIE VYE DACEY, R.N., *Nurse in charge of Dispensary*

HARRY FREDERICK HOFFMAN, M.D., *Consultant in Mental Hygiene*

WILLIAM MICHAEL BURKHARDT, *Masseur*

Division of Athletics and Physical Education

NELSON AUSTIN KELLOGG, A.B., *Director*

HOWARD ROLAND REITER, B.A., M.A., *Professor of Physical Education*

FAY CONANT BARTLETT, *Assistant Professor of Physical Education and Basketball Coach*

ROBERT BURNETTE ADAMS, B.S. IN BUS. AD., *Assistant Director of Athletics, Baseball Coach, Assistant Football Coach, Manager of Ticket Sales*

ALBERT AUSTIN TATE, B.S., *Head Football Coach*

GLEN WALTER HARMESON, B.S., *Head Football Coach,* from March 1, 1934

MORRIS EUGENE KANALY, *Instructor in Physical Education and Track Coach*

WILLIAM SHERIDAN, *Wrestling Coach, Head Trainer, Manager of Stores, Superintendent of Lehigh Field*

PAUL ROBERT CALVERT, B.P.E., *Assistant Coach of Football, Baseball, and Basketball*

PETER MORRISSEY, *Swimming Coach, Assistant Trainer*

JAMES MAHONEY, *Assistant in Swimming*

HARRY C. CARPENTER, *Soccer Coach*

University Band

THOMAS EDGAR SHIELDS, A.A.G.O., *Director*

Promotion and Publicity

ANDREW EDWARD BUCHANAN, JR., CH.E., *Executive Secretary*

Office of Superintendent of Buildings and Grounds

ANDREW WILLARD LITZENBERGER, *Superintendent of Buildings and Grounds*

JOHN DAVID HARTIGAN, *Superintendent of the Power Plant*

Consulting Architects

VISSCHER AND BURLEY, New York, N. Y.

Alumni Association

ANDREW EDWARD BUCHANAN, JR., CH.E., *Executive Secretary*

JOHN ANDRE BRODHEAD, M.E., M.A., *Director of Placement Service*

JOHN WALTER MAXWELL, B.S. IN BUS. AD., *Assistant Editor, Alumni Bulletin*

Standing Committees

ART EXHIBITIONS: Professors Palmer, Howland, Librarian Leach, Vice-President Emery.

ATHLETIC ELIGIBILITY: Professors Kellogg (*ex officio*), Long (1934), More (1935), Beaver (1936), Carothers (1937).

GRADUATE BOARD: President Richards (*ex officio*), Dean McConn (*ex officio*), Professors S. J. Thomas, Carothers, Smith, Larkin, Miller, More (*Executive Secretary*), Gipson, Hughes, Seyfert, Fort, Bidwell, Sutherland, Long, H. P. Thomas.

INSTITUTE OF RESEARCH: President Richards (*ex officio*), Professors Ullmann, Sutherland, Seyfert, Larkin, Stoughton, Eckfeldt, Bidwell, Miller, Hall, Carothers, Gipson.

LECTURES: Professor Reynolds (1934), Registrar Curtis (1934), Professors Smith (1935), Hibshman (1935), Crum (1936), Bradford (1937).

LIBRARY: Librarian Leach (*ex officio*), Professors Diamond (1934), B. L. Miller (1935), Bidwell (1936), Seyfert (1937), Palmer (1938).

MENTAL HYGIENE: Professor Hughes, Dean McConn, Dr. Bull, Dr. Hoffman.

REGISTER: Vice-President Emery, Registrar Curtis, Professors Smith, Cowin, Wilson.

SCHOLARSHIPS AND LOANS: Vice-President Emery, Dean McConn, Treasurer Okeson.

TEACHER PLACEMENT: Professors H. P. Thomas, Hughes, Dean McConn, Professors Palmer, Ullmann, Mr. Brodhead.

WILLIAMS SENIOR PRIZE: Professors Smith, Palmer, Hughes, Carothers, Ford.

HISTORY

Lehigh University was chartered by the Legislature of Pennsylvania by an act dated February 9, 1866. In 1865 the Hon. Asa Packer, of Mauch Chunk, inaugurated a movement to provide an institution that would afford training and education in the learned professions as then recognized, and in technical branches, the importance of which was then just becoming apparent in the development of the industrial and transportation interests of the country. He made an initial donation of a large tract of land for this purpose and the sum of $500,000.00 to which he added largely during his lifetime and by his will.

Since its foundation the equipment and resources of the University have steadily increased through the continued interest of the University's trustees, alumni, and friends. The present endowment totals $5,343,171.41. The first important addition to the University's original plant was the Sayre Observatory, donated in 1869 by Robert H. Sayre, of Bethlehem. Later donations include Packer Memorial Church, 1887; Williams Hall, 1902; Drown Memorial Hall, 1907; the Armory, 1907; the Wilbur Heating Plant and Engineering Laboratory, 1907; Taylor Hall, 1907; Sayre Park, 1909; the Coxe Mining Laboratory, 1910; the Fritz Engineering Laboratory, 1910; Taylor Gymnasium and Taylor Field, 1913; the Alumni Memorial Building, 1924; the James Ward Packard Electrical and Mechanical Laboratory, 1926; the Library Extension, 1928.

REQUIREMENTS FOR ADMISSION

Candidates for admission to Lehigh University must be at least sixteen years of age, must present testimonials of good moral character, and must be qualified in fifteen entrance units as enumerated below. The University reserves the right to require any candidate for admission to present himself for a personal interview and to select candidates otherwise qualified on the basis of such an interview. Women are not admitted to the work of the first semester or of the second semester either as

undergraduate students or as special students. No registration is accepted later than the tenth day of instruction.

All students entering the University are required to present a certificate of vaccination against small-pox within three years of the time of entering the University. They must also have a scar as evidence of previous successful vaccination. Students who cannot comply with this regulation are vaccinated by the director of the Health Service, and in case the vaccination is unsuccessful are re-vaccinated.

THE COLLEGE OF ARTS AND SCIENCE

Candidates for admission to the College of Arts and Science must present credit in the following units:

	Units*
English,	3
Latin or German or French or Spanish,	2
History,	1
Elementary Algebra,	1
Intermediate Algebra,	½
Plane Geometry,	1
Elective subjects,	6½
	15

THE COLLEGE OF BUSINESS ADMINISTRATION

Candidates for admission to the College of Business Administration must present credit in the following units:

	Units*
English,	3
Latin or German or French or Spanish,	2
History,	1
Elementary Algebra,	1
Intermediate Algebra,	½
Plane Geometry,	1
Elective subjects,	6½
	15

* A unit represents a year's study in a single subject in a secondary school, comprising the work of 180 recitation periods (5 periods a week for 36 weeks) of forty minutes each or the equivalent.

THE COLLEGE OF ENGINEERING

Candidates for admission to the College of Engineering must present credit in the following units:

	Units*
English,	3
Latin or German or French or Spanish,	2
History,	1
Elementary Algebra,	1
Intermediate Algebra,	½
Plane Geometry,	1
Solid Geometry or Advanced Algebra,	½
Plane Trigonometry and Logarithms,	½
Elective subjects,	5½
	15

ELECTIVE SUBJECTS

	Units*
English, fourth year,	1
Intermediate Algebra, second semester,	½
Advanced Algebra,	½
Solid Geometry,	½
Plane Trigonometry and Logarithms,	½
Greek,	1, 2, or 3
Latin,	1, 2, 3, or 4
French,	1, 2, 3, or 4
German,	1, 2, 3, or 4
Spanish,	1, 2, 3, or 4
American History,	1
Ancient History,	½ or 1
Mediaeval and Modern History,	1
English History,	½ or 1
Civics,	½, 1, or 1½
Economics,	½ or 1
General Science,	1
Physics,	1 or 2
Chemistry,	1 or 2
Biology,	½, 1 or 2

* A unit represents a year's study in a single subject in a secondary school, comprising the work of 180 recitation periods (5 periods a week for 36 weeks) of forty minutes each or the equivalent.

Botany,	½ or 1
Zoology,	½ or 1
Physiography,	½ or 1
Industrial History,	½ or 1
Business Law,	½ or 1
Commercial Geography,	½ or 1

Applicants may also elect not more than two units from the following supplementary list:

Physiology and Hygiene,	½ or 1
Manual Training,	½ or 1
Freehand Drawing,	½
Mechanical Drawing,	½
Bookkeeping, Stenography, and Typewriting,	1 or 2

Other subjects from the curriculum of a high school of the first class may be credited up to a total of one unit.

ADMISSION BY CERTIFICATE

Lehigh University has no permanent arrangement with any school whereby certificates are accepted in place of entrance examinations; but certificates are ordinarily accepted from first-class high schools in Pennsylvania, and from schools accredited by the Association of Colleges and Secondary Schools of the Middle States and Maryland, the New England College Entrance Certificate Board, the Regents of the University of the State of New York, the North Central Association of Colleges and Secondary Schools, the Association of Colleges and Secondary Schools of the Southern States, and the state universities of those states having such institutions.

Upon completion of his course an applicant for admission by certificate should request his school principal to send to the Registrar a complete record of his work. Blanks for this purpose are supplied by the University.

Each candidate for admission must present full school and college records from each institution previously attended; failure to present such records will result in cancellation of registration.

ADMISSION BY EXAMINATION

Examinations at the University

Examinations for admission to the University will be held in 1934 as follows:

Algebra, Elementary	June 15,	Sept. 8,	2:00 p.m.
Algebra, Intermediate	June 15,	Sept. 8,	4:00 p.m.
Algebra, Advanced	June 14,	Sept. 7,	2:00 p.m.
Biology	June 13,	Sept. 6,	8:30 a.m.
Business Law	June 14,	Sept. 7,	2:00 p.m.
Chemistry	June 13,	Sept. 6,	8:30 a.m.
Civics	June 14,	Sept. 7,	2:00 p.m.
Economics	June 14,	Sept. 7,	2:00 p.m.
English	June 14,	Sept. 7,	8:30 a.m.
French	June 16,	Sept. 10,	8:30 a.m.
General Science	June 13,	Sept. 6,	8:30 a.m.
Geometry, Plane	June 15,	Sept. 8,	8:30 a.m.
Geometry, Solid	June 15,	Sept. 8,	8:30 a.m.
German	June 16,	Sept. 10,	8:30 a.m.
History			
American	June 13,	Sept. 6,	2:00 p.m.
Ancient	June 15,	Sept. 8,	8:30 a.m.
English	June 15,	Sept. 8,	2:00 p.m.
Mediaeval and Modern	June 13,	Sept. 6,	2:00 p.m.
Latin	June 16,	Sept. 10,	8:30 a.m.
Physics	June 13,	Sept. 6,	2:00 p.m.
Physiology	June 13,	Sept. 6,	8:30 a.m.
Spanish	June 16,	Sept. 10,	8:30 a.m.
Trigonometry	June 14,	Sept. 7,	2:00 p.m.
Zoology	June 13,	Sept. 6,	8:30 a.m.

Examinations in other subjects presented for elective units may be arranged by correspondence with the Registrar.

Candidates for admission who wish to take examinations for advanced credit in any subjects should notify the Registrar before September 1.

Examinations at Schools

Upon the request of school principals the June entrance examinations may be held at schools on the regularly scheduled dates. Requests for examination papers should be sent to the Registrar before June 1.

College Board Examinations

Certificates of the College Entrance Examination Board are accepted in subjects in which the recorded grade is 60 per cent or higher.

The examinations of the College Entrance Examination Board are held in June of each year. Information in regard to these

examinations, application blanks, and a circular giving detailed definitions of requirements in all examinations may be obtained from the College Entrance Examination Board, 431 West 117th Street, New York, N.Y.

ADMISSION TO ADVANCED STANDING

A student who desires to transfer to Lehigh University from another college or university must submit an official transcript of his record in the other institution; this certificate should include his college credits, a list of the entrance credits accepted for admission to that other institution, and a statement of honorable dismissal.

A candidate for admission to Lehigh University with advanced standing must meet the entrance requirements prescribed for undergraduates. In the event that the entrance credits presented for admission to the former institution do not meet the entrance requirements of Lehigh University in full, subjects which have been taken in college may be presented to make up the deficiencies. No student is admitted to Lehigh University who is not eligible to continue in good scholastic standing at the institution from which he is transferring.

A candidate who has attended more than one college or university must present a record from each institution; failure to submit a complete record of former academic experience will result in cancellation of registration.

Graduates of other colleges are admitted to Lehigh University without examinations. The length of time for the completion of a curriculum depends upon the student's attainments at entrance and upon his ability. Graduates of recognized colleges of liberal arts and sciences whose courses have included a year of physics, a year of chemistry, and mathematics through the calculus are admitted to the College of Engineering with junior standing, and may expect to receive the degree of B.S. in Engineering on the successful completion of a two year program which will be individually planned for each candidate.

A student who intends to take an engineering curriculum at Lehigh University after graduation from college should so arrange his work in college as to cover as many as possible of the subjects of the freshman and sophomore years of the engineering curriculum he selects.

ADMISSION OF SPECIAL STUDENTS

Special students may be admitted on recommendation of the directors of curricula and upon approval of the Dean. Candidates must be at least twenty-one years of age and must present evidence of ability to pursue with profit the subjects that they wish to study at the University.

ENTRANCE REQUIREMENTS IN DETAIL

ENGLISH

Preparation in English has three main objects: (1) command of correct and clear English, spoken and written; (2) ability to use the vernacular with accuracy and appreciation; and (3) some acquaintance with the simpler English classics.

English Grammar and Composition. The first two objects require instruction in grammar and composition. English grammar should be reviewed in the secondary school, and correct spelling and grammatical accuracy should be rigorously exacted in connection with all written work during the four years. The principles of English composition governing punctuation, the use of words, paragraphs, and the different kinds of composition, including letter-writing, should be thoroughly mastered; and practice in composition, oral as well as written, should extend throughout the secondary school period. Written exercises may well comprise narration, description, and easy exposition based upon the principles of elementary rhetoric, as given in any approved high school rhetoric. It is advisable that subjects for this work be taken from the student's personal experience, general knowledge, and studies other than English, as well as from his reading in literature.

Literature. The third object is sought by means of two lists of books, headed respectively reading and study, from which may be framed a progressive course in literature covering four years. In connection with both lists, the student should be trained in reading aloud and be encouraged to commit to memory some of the more notable passages both in verse and in prose. The books for reading and study are to be selected from the group suggested by the Conference on Uniform Entrance Requirements in English. 3 or 4 units

HISTORY

The requirement in history is based on the recommendation of the Committee of Seven of the American Historical Association.

Ancient History, with special reference to Greek and Roman History, including also a short introductory study of the more ancient nations, and the chief events of the early Middle Ages down to the death of Charlemagne (814). 1 unit

Mediaeval and Modern History, from the death of Charlemagne to the present time. 1 unit

English History, with due reference to social and political development. 1 unit

American History and Civil Government, with due reference to social and political development. 1 unit

The examinations in history are so framed as to require comparison and the use of judgment on the pupil's part rather than the mere use of memory. The examinations presuppose the use of good text-books, collateral reading, and practice in written work. Geographical knowledge is tested by requiring the location of places and movements on an outline map.

MATHEMATICS

Elementary Algebra (Algebra to Quadratic Equations). The four fundamental operations for rational algebraic expressions; factoring, determination of highest common factor and lowest common multiple by factoring; fractions, including complex fractions, and ratio and proportion; linear equations, both numerical and literal, containing one or more unknown numbers; problems depending on linear equations; radicals, including the extraction of the square root of polynomials and of numbers; exponents, including the fractional and negative. 1 unit

Intermediate Algebra (Quadratic Equations and Beyond). Quadratic equations, both numerical and literal; simple cases of equations with one or more unknown numbers that can be solved by the methods of linear or quadratic equations; problems depending on quadratic equations; the binomial theorem for positive integral exponents; the formulas for the nth term and the sum of the terms of arithmetic and geometric progressions with applications. ½ unit

Advanced Algebra. Permutations and combinations, limited to simple cases; complex numbers, with graphical representation of sums and differences; determinants, chiefly of the second, third, and fourth orders, including the use of minors and the solution of linear equations; numerical equations of higher degree, and as much of the theory of equations, with graphical methods, as is necessary for their treatment, including Descartes' rule of sign and Horner's method, but not Sturm's functions or multiple roots. ½ unit

Plane Geometry. The usual theorems and constructions of good text-books, including the general properties of plane rectilinear figures; the circle and the measurement of angles; similar polygons; areas; regular polygons; and the measurement of the circle. The solution of numerous original exercises, including locus problems; applications to the mensuration of lines and of plane surfaces. 1 unit

Solid Geometry. The usual theorems and constructions of good text-books, including the relations of planes and lines in space; the properties and measurements of prisms, pyramids, cylinders, and cones; the sphere and the spherical triangle. The solution of numerous original exercises, including locus problems; applications to the mensuration of surfaces and solids. ½ unit

Plane Trigonometry. Definitions and relations of the six trigonometric functions as ratios; circular measurements of angles; proofs of principal formulas, in particular for the sine, cosine, and tangent of the sum and the difference of two angles, of the double angle, and the half angle, the product expressions for the sum or the difference of two sines or of two cosines, etc.; the transformation of trigonometric expressions by means of these formulas; solution of trigonometric equations of a simple character; theory and use of logarithms (without the introduction of work involving infinite series); the solution of right and oblique triangles and practical applications. Candidates must bring their logarithmic tables to the examination. ½ unit

Candidates must have a knowledge of the metric system and be prepared to solve problems in either algebra or geometry involving the use of the metric system.

The entrance requirements in Solid Geometry and Plane Trigonometry are included in Math. 1 and Math 16 offered during the summer session.

GREEK

Greek. Grammar; elementary prose composition, consisting principally of detached sentences to test the candidate's knowledge of grammatical construction; Xenophon: the first four books of the *Anabasis;* the translation, at sight, of a passage from some work of Xenophon. 2 units

Greek. Homer's *Iliad*, I-III: The first three books of the *Iliad* (omitting II, 494-end), and the Homeric forms, constructions, and prosody. 1 unit

LATIN

The requirements in Latin are in accord with those of the College Entrance Examination Board.

The Latin reading shall not be less in amount than four books of Cæsar, six orations of Cicero, and six books of Vergil's Aeneid for the second, third, and fourth years respectively. There are no prescribed readings, but the following recommendations are made:

(1) In the second year the early reading should be easy Latin which may be "made" or adapted Latin; not less than one semester of this year should be devoted to the reading of selections from Cæsar. The reading for this year may also in-

clude easy selections from such authors as Aulus Gellius, Eutropius, Nepos, Phaedrus, Quintus Curtius Rufus, and Valerius Maximus, or books of selections containing some of these together with other authors of prose works.

(2) In the third year, if the reading be in prose, not less than one semester should be devoted to the reading of selections from Cicero; the reading for the year may also include selections from such authors as Pliny, Sallust, and Livy, or books and selections containing these and other authors of prose works.

(3) In the fourth year, if the reading be in poetry, not less than one semester should be devoted to the reading of selections from Vergil; and the reading for the year may also include selections from such works as the Metamorphoses, Tristia, Heroides, and Fasti of Ovid, or books of selections containing poems or extracts from Ovid or from other poets.

The College Entrance Examination Board has prepared a word list which includes a vocabulary that students are expected to have at the end of two years, three years, and four years of Latin study. The list will serve to reassure teachers that deviation from the beaten path is safe provided they take the required vocabulary as one of their guides in making their choice of selections from the works recommended above. This word list may be obtained from the College Entrance Examination Board, 431 West 117th Street, New York, N. Y.

GERMAN

Elementary German, A. This requirement follows, in the main, the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) careful drill in pronunciation; (2) the memorizing and frequent repetition of easy colloquial sentences; (3) drill in the rudiments of grammar, that is, upon the inflection of the articles, of such nouns as belong to the language of everyday life, of adjectives. pronouns, weak verbs, and the more usual strong verbs; also upon the use of the more common prepositions, the simpler use of the modal auxiliaries, and the elementary rules of syntax and word-order; (4) abundant easy exercises, designed not only to fix in mind the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression; (5) reading of from 75 to 100 pages of graduated texts from a reader, with constant practice in translating into German easy variations upon sentences selected from the reading lesson (the teacher giving the English), and in the reproduction from memory of sentences previously read.

During the second year the work should comprise: (1) the reading of from 150 to 200 pages of literature in the form of

easy stories and plays; (2) accompanying practice, as before, in the translation into German of easy variations upon the matter read and in the off-hand reproduction, sometimes orally and sometimes in writing, of the substance of short and easy selected passages; (3) continued drill in the rudiments of the grammar, directed to the ends of enabling the pupil, first, to use his knowledge with facility in the formation of sentences, and, secondly, to state his knowledge correctly in the technical language of grammar. 2 units

INTERMEDIATE GERMAN, B. This work should comprise, in addition to the elementary course, the reading of about 400 pages of moderately difficult prose and poetry, with constant practice in giving, sometimes orally and sometimes in writing, paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; also grammatical drill upon the less usual strong verbs, the use of articles, cases, auxiliaries of all kinds, tenses and modes (with special reference to the infinitive and subjunctive), and likewise upon word order and word formation. 1 unit

FRENCH

ELEMENTARY FRENCH, A. This requirement follows in the main the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) careful drill in pronounciation; (2) the rudiments of grammar, including the inflection of the regular and the more common irregular verbs, the plural of nouns, the inflections of adjectives, participles, and pronouns; the use of personal pronouns, common adverbs, prepositions, and conjunctions; the order of words in the sentence and the elementary rules of syntax; (3) abundant easy exercises, designed not only to fix in the memory the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression; (4) the reading of from 100 to 175 pages of standard texts with constant practice in translating into French easy variations upon the sentences read (the teacher giving the English), and in reproducing from memory sentences previously read; (5) writing French from dictation.

During the second year the work should comprise: (1) the reading of from 250 to 400 pages of easy modern prose in the form of stories, plays, or historical or biographical sketches; (2) constant practice, as in the previous year, in translating into French easy variations upon the texts read; (3) frequent abstracts, sometimes oral and sometimes written, of portions of the texts already read; (4) writing French from dictation; (5) continued drill upon the rudiments of grammar, with constant application in the construction of sentences; (6) mastery of the forms and uses of pronouns and pronominal adjectives,

of all but the rare irregular verb forms, and of the simpler uses of the conditional and subjunctive. 2 units

INTERMEDIATE FRENCH, B. This should comprise the reading of from 400 to 600 pages of French of ordinary difficulty, a portion to be in the dramatic form; constant practice in giving French paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; the study of a grammar of moderate completeness; writing from dictation. 1 unit

SPANISH

ELEMENTARY SPANISH, A. Two years' preparation, covering the following ground:

During the first year: (1) drill in the correct production of Spanish sounds; (2) the rudiments of grammar, illustrated by abundant easy exercises; (3) the reading of about 150 pages of graduated text with constant translating into Spanish of easy variations of sentences read, the teacher giving the English; (4) aural drill: practice in translating into English Spanish words, clauses, and sentences heard but not seen, the teacher giving the Spanish.

During the second year: (1) reading of 250 to 400 pages of easy modern prose; (2) constant practice in translating into Spanish easy variations upon the text read; (3) aural practice and drill in pronounciation; (4) mastery of the forms and uses of pronouns, of the subjunctive mode, and of the forms of the radical changing verbs. 2 units

INTERMEDIATE SPANISH, B. The reading of not less than 500 additional pages of Spanish prose together with the translation of at least 40 pages of simple connected English prose into Spanish. 1 unit

PHYSICS

The course of instruction in physics should include:

(1) The study of some standard text-book, for the purpose of obtaining a connected view of the subject; (2) instruction by lecture table demonstrations, to be used mainly for illustration of the facts and phenomena of physics; (3) individual laboratory work consisting of at least thirty experiments designed to supplement the pupil's fund of concrete knowledge and chosen with a view to furnishing forceful illustration of fundamental principles and their practical application. 1 unit

CHEMISTRY

The requirement in chemistry is based on the report of the Committee on Chemistry of the Science Department of the National Education Association.

ELEMENTARY CHEMISTRY. It is recommended that the candidate's preparation in chemistry include: (1) individual laboratory work, comprising at least forty exercises; (2) instruction by lecture table demonstrations, to be used mainly as a basis

for questioning upon the general principles involved in the pupil's laboratory investigations; (3) the study of at least one standard text-book, to the end that the pupil may gain a comprehensive and connected view of the most important facts and laws of elementary chemistry. 1 unit

Students properly qualified are examined in Elementary Chemistry during freshman week; those passing the examination may omit Elementary Chemistry, Chem. 1 and 11, and take instead Chem. 3 and 13 during the first semester.

BIOLOGY

BIOLOGY. A year's work in general biology. 1 unit
In order to be acceptable in satisfaction of the distribution requirement in biology in the College of Arts and Science, the course offered may not be botany, zoology, or physiology but must be a general course covering such topics as are enumerated in the description of Biol. 1 in this Register. Whether the course offered is acceptable will be determined at the University.

ZOOLOGY

ZOOLOGY. The equivalent of Jordan, Kellogg, and Heath's *Animal Studies*, with laboratory work. ½ or 1 unit

BOTANY

BOTANY. An amount equal to that contained in Bergen's *Foundations of Botany*, with laboratory work. ½ or 1 unit

PHYSIOLOGY AND HYGIENE

PHYSIOLOGY AND HYGIENE. A course covering approximately what is given in such a text-book as Huxley and Youman's *Physiology and Hygiene*. ½ or 1 unit

PHYSIOGRAPHY

PHYSIOGRAPHY. The study of a standard text-book in physical geography. Individual laboratory work, comprising at least forty exercises, with notebook, is recommended. ½ or 1 unit

DRAWING

FREEHAND DRAWING. Sketching of simple geometrical figures, of objects, and from copy. At least twenty plates must be submitted. ½ unit

MECHANICAL DRAWING. The use of instruments and the preparation of at least twenty plates, illustrating the elements of descriptive geometry or simple machine parts. ½ unit

MANUAL TRAINING

MANUAL TRAINING. Shop work in wood or metal in schools giving courses in manual training. ½ or 1 unit

BOOKKEEPING, TYPEWRITING, AND STENOGRAPHY

BOOKKEEPING, TYPEWRITING, AND STENOGRAPHY, covering a formal course of study in school. 1 or 2 units

UNDERGRADUATE TUITION AND OTHER FEES

Tuition, in all colleges of the University, per annum....	$400.00
Health Service fee	12.00
Athletic fee	15.00
Library fee	5.00
Student Activities fee	5.00
Total annual fees	$437.00

These fees are payable as follows:

FIRST SEMESTER

(Payable on the registration days in September)

Tuition fee	$225.00
Athletic fee, in full	15.00
One-half of the annual Health Service fee	6.00
One-half of the annual Student Activities fee	2.50
One-half of the annual Library fee	2.50
Total fees, first semester	$251.00

SECOND SEMESTER*

(Payable on the registration days in February)

Tuition fee	$175.00
One-half of the annual Health Service fee	6.00
One-half of the annual Student Activities fee	2.50
One-half of the annual Library fee	2.50
Total fees, second semester	$186.00

MATRICULATION AND GRADUATION FEES. New students pay, once only, on admission, a matriculation fee of $5.00; students at graduation pay a graduation fee of $10.00.

LABORATORY FEES AND DEPOSITS. There are also laboratory fees or deposits in laboratory courses to cover the cost of laboratory supplies used by the individual students and to provide for breakage of glassware and instruments; the amounts of

* Students entering or re-entering in the second semester pay first semester fees, except that they pay only one-half the athletic fee, $7.50.

these fees and deposits are given in the description of courses in connection with each laboratory course. A deposit of $25.00 is made by each student taking courses in Military Science and Tactics; this deposit is refunded when the government property issued to the student is returned.

Late Registration Fees: The penalty for late registration is $1.00 a day, up to a maximum of $5.00, for each day of delay beyond the registration days in taking out the registration ticket; and a registration not completed within three days after the date on the registration ticket is subject to a late registration fee of $1.00 a day up to a maximum of $5.00.

Summer Session Tuition. The tuition for courses taken in the summer session is at the rate of $10.00 a credit hour.

Special Examination Fees. Special examinations, authorized by the Committee on Standing of Students, are subject to a fee of $5.00 each. This regulation applies to the psychological examination required of new students, if taken at other than the scheduled date. Any student who fails to keep his appointment for his physical examination is charged a late examination fee at the rate of $1.00 a day until he applies for and receives another appointment; if he fails to meet his second appointment or any succeeding appointments, he again becomes subject to the same fee at the same rate.

Refunds. A refund of one-half of the tuition and laboratory fees of the current semester, one-half of the athletic fee and of the student activities fee, and the unused balance of chemistry deposits, is made to students who formally withdraw from the University within four weeks after the beginning of the semester; a refund of three-fourths of the tuition and laboratory fees, one-half of the athletic fee and of the student activities fee, and the unused balance of chemistry deposits is made to students who formally withdraw within two weeks; a refund of the entire tuition and laboratory fees, the entire athletic fee and the student activities fee, and the unused balance of chemistry deposits is made to students who formally withdraw within one week. The matriculation fee, the health service fee, and the library fee are not refunded. If a student is obliged to withdraw through injury or other physical disability and is unable to return later in that semester, a pro-rata credit is al-

lowed toward the tuition of the corresponding semester a year later.

EXEMPTIONS. Students registered for fewer than seven semester hours are exempted from the library and health service fees. The payment of the athletic fee and the students' activities fee is optional for graduate students and also for undergraduates who are registered for fewer than seven semester hours.

SPECIAL SCHEDULES. Tuition for special schedules of less than twelve hours in any semester is at the rate of $12.50 a semester hour.

STUDENT ACTIVITIES FEE. The student activities fee is appropriated as follows: Lehigh *Brown and White*, $1.75; Lehigh Union, $0.75; Arcadia, $0.50; Class dues, $1.00; Mustard and Cheese, $0.50; Musical Clubs, $0.50.

To be eligible for a degree from Lehigh University, a student not only must have completed all of the scholastic requirements for the degree, but must have paid all University fees and all bills for the rental of rooms in the dormitories, or for damage to University property or equipment, or for any other indebtedness to the University; this regulation, however, does not apply to any indebtedness for deferred tuition or for loans from trust funds administered by the Uuiversity, which are protected by properly executed notes approved by the Comptroller.

EXPENSES

Necessary expenses for the collegiate year, clothing and traveling not included, are estimated at $500.00 in addition to tuition.

The University dormitories accommodate 171 students. The charge for single rooms is $50.00, $65.00, or $80.00 a year; suites of three or four rooms rent at $100.00 or $120.00 for each occupant. Applications for rooms in the University dormitories should be filed with the Bursar.

A cafeteria is located in Drown Memorial Hall. Numerous private householders in the city offer rooms and board at moderate prices; information concerning such rooms and board may be obtained from the Registrar.

Books, stationery, and drawing instruments may be purchased at the Supply Bureau in the Alumni Memorial Building.

THE COLLEGE OF ARTS AND SCIENCE

The curriculum of the College of Arts and Science is based upon the general principles of distribution and concentration. The object of the distribution requirements is to give the student an elementary knowledge of the fields of contemporary thought and to orient him in the world of man and nature. These requirements are coordinated so far as possible with the work of the preparatory schools, and the number and nature of the prescribed courses to be taken in college is dependent upon the subjects presented for entrance.

The number of elective courses depends on the individual's distribution requirements but the work is so arranged that at least one free elective is open to every freshman. Well prepared freshmen have greater freedom in the choice of electives. In the succeeding years, the number of free electives increases, being limited solely by the demands of the major work and the number of courses allowed the student per semester. Electives in the freshman and sophomore years should be used as orientation courses, for the purpose of enabling the student to discover his major interests. In the last two years the selection of electives is determined by the personal choice of the individual student. The concentration or major requirement enables the student to capitalize his interests and to acquire a thorough grounding in some particular field.

The minimum course of study comprises fifteen scholastic hours or periods weekly. Students of proved ability, however, are not limited to this minimum.

The degree of Bachelor of Arts is conferred upon graduates of the College of Arts and Science.

Requirements for Graduation

1. The completion of one hundred twenty credit hours of collegiate work, apportioned so as to cover the distribution and concentration requirements, in addition to Military Science and Tactics, Moral and Religious Philosophy, and Physical Education required of all students.

2. A comprehensive examination in the major field with a grade of not less than C.

Distribution Requirements

1. English. Twelve semester hours. These are ordinarily Engl. 1, 2, 4, and 5. Students who demonstrate satisfactory ability in written composition in their placement examinations may satisfy this English requirement by passing Engl. 4 and 5 or an equivalent.

2. Foreign Language. A reading knowledge of Latin, Greek, French, or German and an elementary knowledge of a second of these languages are required of all students. The requirement takes into consideration work done in the preparatory schools and may be met in the following ways:

Reading knowledge. Students may satisfy this requirement by examination; otherwise, students who offer three or four years of Latin, French, Greek, or German at entrance satisfy this requirement by passing Lat. 1, 2, Gk. 5, 6, Fr. 21, 22, or Ger. 9, 10, in course; those who offer only two years of Latin, Greek, French, or German continue for two years the language presented. With the permission of the director of the College such students may substitute one of the other three languages. Students who offer two years of two or more languages, Latin, Greek, French, or German, may choose from these the language they are to continue. Students who offer two or more years of Spanish only take Latin, Greek, French, or German in college for two years in addition to the elementary requirement stated below.

Elementary knowledge. The elementary knowledge may be established by examination at entrance or later or by passing Lat. 31, 32, Gk. 1, 2, Fr. 1, 2, or Ger. 1, 2, or any higher course in these languages.

3. Biology, Chemistry, Geology, Philosophy, Physics, and Psychology. Three semester hours each. If a student has received entrance credit for one year's work in any of these subjects, he may omit that subject from his requirement. This requirement may be met by taking specially designed introductory courses in these subjects.

4. Mathematics and Astronomy. Including the preparatory mathematics each student must present for graduation elementary algebra, intermediate algebra, plane geometry, plane trigonometry, and either advanced algebra or solid geometry

or astronomy. Unified mathematics pursued in college may be substituted semester by semester for any of the last four subjects.

5. History. Nine semester hours. For each year of history for which a student receives entrance credit this distribution requirement is reduced three hours. Students who have had no course in ancient history at entrance are required to take at least three semester hours in ancient history in college.

6. Economics. Six semester hours in economics are required of all students who have not had at least one full year of economics in the preparatory school.

Distribution requirements except economics should be met during the freshman and sophomore years. The assignment of the courses covering the distribution requirement of the individual student is made by the director of the College.

Concentration Requirements—Majors

During the second semester of the freshman year each student must select some sequence of studies as his major field. A major consists of at least twelve semester hours of advanced work in the field chosen. Including preliminary college work, the minimum number of hours constituting a major is twenty-four. Change of major is permitted up to the end of the sophomore year. Majors must be approved by the professors concerned and the director of the College.

The major work is designed to enable a student to master his chosen field so far as that is possible in the two years devoted to the subject. In all fields certain courses are prescribed but the mere passing of courses will not satisfy the major requirement. It is expected that the student will read widely in his subject and prepare himself largely through his own reading and his own independent work for his final comprehensive examination. After a student has selected a major subject, the head of the department in which the major is selected becomes the official adviser of the student and guides him in his choice of courses. The director of the College of Arts and Science may be consulted at any time concerning the major requirements. Details concerning the major requirements are to be found in the printed Major Pamphlet.

A comprehensive examination in the major subject is required of all students. This examination is given at the end of the senior year and may be oral or written or both. The comprehensive examination is given under the direction of the head of the major department; at least two university teachers and, whenever possible, representatives of at least two departments take part in the examination.

On the advice of the head of the department in which the major work is being done and with the consent of the director of the College, a senior of unusual merit who wishes to concentrate in his chosen field may be allowed to substitute not more than six hours of unscheduled work per semester for six hours of elective work otherwise required for graduation.

Special Honors (Honors in Majors)

Special honors are awarded at the end of the senior year, on recommendation of the head of the department concerned and by vote of the faculty, to students who have done advanced work of unusual merit in some chosen field. Candidates for special honors must indicate during the first semester of the junior year their intention to work for such honors. Awards are based on grades obtained in the subject chosen, the results in extra work assigned, and the general proficiency of the candidate as evidenced by either a final examination or a thesis, as the head of the department involved may direct.

Special Regulations for English

Students in the College of Arts and Science who persistently use poor English may be reported at any time to the director of the College. He may require that they take additional English without credit toward graduation. Toward the end of the junior year each junior in the College of Arts and Science must report to the department of English for an exercise in impromptu writing. Students found seriously deficient in this test are reported to the director of the College, who may require that they take additional English without credit toward graduation.

Elective Studies

1. Courses open to freshmen as electives.

FRESHMAN ELECTIVES

FIRST SEMESTER

Number	Title	Cr.Hrs.
Biol. 1	Biology	3
Bus. 1	Ind. Evolution	3
Chem. 1	Elem. Chemistry.	2
Chem. 3	Inter. Chemistry.	2
Chem. 11	Chemistry Lab...	2
Chem. 12	Chemistry Lab...	1
Chem. 13	Chemistry Lab...	2
Chem. 14	Chemistry Lab...	1
Engl. 3a	World Literature	3
Engl. 4	Drama	3
Engl. 10	Public Speaking.	3
F.A. 5	Freehand Draw..	3
Fr. 1	Elem. French...	3
Fr. 11	Inter. French....	3
Fr. 21	Adv. French....	3
Geol. 3, 6	Intro. to Geology.	3
Ger. 1	Elem. German	3
Ger. 3	Inter. German	3
Ger. 9	Adv. German	3
Gk. 1	Elem. Greek	3
Gk. 3	Inter. Greek	3
Gk. 5	Adv. Greek	3
Hist. 13	U.S. History	3
Hist. 25	European History	3
Ital. 1	Elem. Italian	3
Lat. 1a	Pliny, Cicero	3
Lat. 1b	Vergil, Ovid	3
Lat. 21	Ancient History.	3
Lat. 31	Elem. Latin	3
Lat. 33	Inter. Latin	3
Math. 1	Plane Trig.	3
Math. 1a	Unified Math.	3
Math. 2	Algebra	3
Math. 16	Solid Geometry..	3
M.R.Phil. 11	Intro. M.R. Phil.	1
Phil. 3	Intro. Philosophy	3
Phys. 12	Intro. to Physics.	3
Psych. 1	Elem. Psychology	3
Span. 1	Elem. Spanish	3
Span. 11	Inter. Spanish	3
Span. 21	Adv. Spanish	3

SECOND SEMESTER

Number	Title	Cr.Hrs.
Astr. 1	Descriptive Astr.	3
Biol. 2	Mam. Anatomy..	2
Biol. 3	Comp. Anatomy.	3
Biol. 6	Botany	3
Bus. 2	Ind. Evolution	3
Chem. 1	Elem. Chemistry.	2
Chem. 8	Stoichiometry	1
Chem. 11	Chemistry Lab...	2
Chem. 20	Qual. Analysis	3
Engl. 3b	World Literature	3
Engl. 5	Drama	3
Engl. 11	Public Speaking.	3
F.A. 6	Freehand Draw..	3
Fr. 1	Elem. French...	3
Fr. 2	Elem. French...	3
Fr. 12	Inter. French....	3
Fr. 22	Adv. French....	3
Geol. 4, 6	Gen. Geology	3
Geol. 8	Historical Geol..	3
Ger. 1	Elem. German	3
Ger. 2	Elem. German	3
Ger. 4	Inter. German	3
Ger. 10	Faust	3
Gk. 2	Elem. Greek	3
Gk. 4	Inter. Greek	3
Gk. 6	Adv. Greek	3
Hist. 14	U.S. History	3
Hist. 26	European History	3
Ital. 2	Elem. Italian	3
Lat. 2	Horace	3
Lat. 22	Ancient History.	3
Lat. 32	Cæsar	3
Lat. 34	Cicero	3
Math. 1	Plane Trig.	3
Math. 2	Algebra	3
Math. 2a	Unified Math.	3
Math. 3	Anal. Geometry..	3
Math. 16	Solid Geometry..	3
M.R.Phil. 11	Intro. M.R. Phil.	1
M.R.Phil. 12	Phil. of Conduct.	1
M.R.Phil. 16	Phil. of Religion.	1
M.R.Phil. 17	Comp. Religion..	1
Phil. 3	Intro. Philosophy	3
Phys. 13	General Physics.	3
Psych. 1	Elem. Psychology	3
Span. 2	Elem. Spanish	3
Span. 12	Inter. Spanish	3
Span. 22	Adv. Spanish	3

2. Sophomores, juniors, and seniors may elect in general any courses for which they have the prerequisites. Elementary courses intended primarily for freshmen and sophomores may not be taken for graduation credit by juniors and seniors without the consent of the director of the College and the student's major adviser.

3. Advanced courses in Military Science and Tactics are optional with other courses and must be approved by the director of the College.

Preparation for Professional Schools and the Professions

While the College of Arts and Science is primarily nonvocational in its objective, it does provide the preliminary training necessary for admission to the various graduate schools and, in some cases, notably in teaching and journalism, prepares directly for a profession. Since a large proportion of the graduates of the College of Arts and Science of Lehigh University continue their work in graduate schools the College offers a number of course combinations designed to give intensive preliminary training for the various fields of medicine, dentistry, public health, law, theology, engineering, business administration, etc. Students who are looking forward toward any one of the graduate schools should consult the director of the College, who will assist them to plan their courses. Illustrative combinations are listed below:

Preparation for Schools of Medicine, Dentistry, and Public Health

Students in the College of Arts and Science who are preparing to enter medical schools must elect the following courses prescribed by the college to meet the demands of the medical schools.

In Biology:

Biol. 1	General Biology
Biol. 2	Mammalian Anatomy
Biol. 3	Comparative Anatomy
Biol. 9	Genetics
Biol. 21	Hygiene
Biol. 54	Bacteriology
Biol. 104	Embryology
Biol. 113	Histology
Biol. 153	Advanced Bacteriology
Biol. 158	Immunology

In Chemistry:

Chem. 1 and 11	Elementary Chemistry and Laboratory, or
Chem. 3 and 13	Intermediate Chemistry and Laboratory
Chem. 6	Advanced Chemistry
Chem. 8 and 20	Stoichiometry and Qualitative Analysis
Chem. 30 and 41	Quantitative Analysis
Chem. 160, 161, 165, 166	Organic Chemistry

In Physics:

Phys. 12	Introduction to Physics
Phys. 13 and 14	General Physics

The major in Public Health is similar to the program arranged for pre-medical students with the exception that less anatomy is taken and in its place advanced courses in public sanitation and serology are elected.

Students preparing for medicine should major in biology or chemistry. Students looking forward to dentistry are advised to complete the four year college course. The work prescribed is the same as for medicine. For students who are unable to spend four years in preparation special programs covering two or three years will be arranged.

The professor of Biology is the official adviser of students preparing for medicine.

Preparation for Law Schools

In general the law schools do not specify any particular preparation beyond that required for a B.A. or B.S. degree. The prospective law student should major in the field which most interests him but should at all events elect courses in English, history, government, economics, and psychology. Latin is not essential but is strongly recommended. At least one course in accounting should be elected by students who are planning to enter corporation law as a profession.

Preparation for Teaching

Students who expect to teach upon graduation should consult with the department of Education early in their college course. A license or certificate is required of every one who teaches in the public schools of Pennsylvania or of any other state. The approved certificate in Pennsylvania for college

graduates is the College Provisional Certificate granted upon completion of twenty-one semester hours of professional or pedagogical courses (including elementary psychology) and a minimum of eighteen semester hours in each subject which the candidate expects to teach. The twenty-one semester hours of professional studies are apportioned as follows:

Psych. 1	Elementary Psychology (3)
Educ. 1	Introduction to Teaching (3)
Educ. 20	Educational Psychology (3)
Educ. 53 and 54	Practice Teaching (6)
Educ. 51, 119, 120, 130, 131, 150, 171	Eective studies (6) and special method courses.

The requirements for certification in other states are similar to those in Pennsylvania, with minor differences.

A student who is preparing to teach should major in the subject he prefers to teach or in Education. Practice teaching is done mainly in the Bethlehem High Schools; but observation, practice, and substitute teaching may be done in elementary schools in Bethlehem and elsewhere. The department of Physical Education offers courses for students who anticipate coaching and supervision of physical education.

Preparation for Journalism

Students who plan to enter the field of journalism directly or through the medium of the graduate school should choose for their field of concentration the major in Journalism offered by the College of Arts and Science. The major consists of the following courses:

Engl. 43	Reporting and Writing
Engl. 44	Advanced Reporting
Engl. 46	Editing and Copy Reading
Engl. 50	Editorial Writing
Engl. 51	Newspaper Problems
Engl. 54	Journalism Seminar
Engl. 71–78	*Brown and White*—at least four semesters

Other requirements include twelve hours of English literature and courses in European history, government, psychology, economics, and sociology.

Preparation for Engineering

If a student in the College of Arts and Science contemplates becoming a candidate for a degree in engineering after the completion of his B.A. curriculum, he should major in mathematics, business, physics, or chemistry, and choose as electives such technical studies as are contained in the earlier years of the engineering curriculum which he wishes to complete. By carefully selecting electives, with the advice and guidance of the director of his curriculum and the professor in charge of the engineering curriculum concerned, the graduate of the B.A. curriculum may enter the engineering curriculum chosen in full standing, and obtain his engineering degree in one or two years of further study. A detailed plan is made for each student.

Preparation for Business Administration

Students who are looking forward to further work in an undergraduate or graduate school of Business Administration or students who plan to enter business directly upon completion of their Arts curriculum should major in the field of their special interests but should elect at least three one-year courses in economics or business administration beyond the introductory economics. They may, of course, major in business administration, but this is not advised unless the student expects to enter business immediately after graduation.

THE COLLEGE OF BUSINESS ADMINISTRATION

The purpose of the College of Business Administration is to provide, for students intending to enter business rather than the professions, thorough training in the principles which underlie all business activity. With this end in view the College offers a four-year curriculum which covers the fundamental economic principles that control the operation of industrial and commercial enterprises, the general laws that determine economic progress, and the basic facts of accounting, finance, and statistics that are applicable to all business.

The College of Business Administration does not pretend to equip students for the management of enterprises or the holding of responsible business positions immediately after graduation. It makes no attempt to provide a substitute for the training and experience in the complex details of any particular business that can be gained only from actual contact with that business. The primary aim is to develop in the student an intelligent understanding of forces and principles, an ability to analyze industrial and commercial phenomena, and a habit of thought that will enable him in later life to cope with the problems which increasing executive responsibility will bring. Above all, the curriculum is intended to give the student such familiarity with various types of business that he can intelligently choose the special branch in which he is most likely to succeed.

In accordance with this plan of training in fundamentals the curriculum in Business Administration is more rigidly outlined than the ordinary curriculum of this type, with less opportunity than is customary for a narrow specialization in a technical field. The student who is especially interested in some such type of work as accounting or finance or industrial administration is given an opportunity to specialize in that field, but the curriculum does not permit specialization at the expense of the work in the fundamentals of industrial history, economic development, and social problems. The freshman

year is devoted to work of a general nature which provides a scientific and literary background for the later work. In the sophomore year the student takes up the basic courses which are prerequisite to the advanced work in business practice. The junior and senior years are devoted chiefly to technical business courses, so arranged that the student must learn the fundamentals common to all business enterprise.

Advanced courses in Military Science and Tactics are optional with other courses and must be approved by the director of the College.

Graduates of this curriculum receive the degree of Bachelor of Science in Business Administration.

THE CURRICULUM IN BUSINESS ADMINISTRATION

FRESHMAN YEAR

FIRST SEMESTER

Number	*Title*	*Cr.Hrs.*
Bus. 1	Ind. Evolution	3
Engl. 1	English	3
Math. 1	Trigonometry	3
Math. 2	or Algebra	
Fr. 1 or 11	French	
Ger. 1 or 3	or German	3
Span. 1 or 11.	or Spanish	
Chem. 1 or 3	Chemistry 2	
Chem. 12 or 14	& Chem. Lab. 1	
Biol. 7	or Biology	3
Geol. 16	or Physiog.	
Phys. 12	or Physics	
Mil. 1	M. S. & T.	2
P.E. 1	Physical Ed.	—
M.R. Phil.	See page 177	—
		17

SECOND SEMESTER

Number	*Title*	*Cr.Hrs.*
Bus. 2	Ind. Evolution	3
Engl. 2	English	3
Math. 2	Algebra	
Math. 3	or Anal. Geom.	3
Astr. 1	or Des. Astr.	
Math. 16	or Sol. Geom.	
Fr. 2 or 12	French	
Ger. 2 or 4	or German	3
Span. 2 or 12.	or Spanish	
Chem. 21	Qual. Anal. 2	
Chem. 8	& Stoich. 1	
Biol. 8	or Biology	3
Geol. 17	or Physiog.	
Phys. 13	or Physics	
Mil. 2	M. S. & T.	2
P.E. 2	Physical Ed.	—
M.R. Phil.	See page 177	—
		17

SOPHOMORE YEAR

FIRST SEMESTER

Number	*Title*	*Cr.Hrs.*
Bus. 3	Economics	3
Bus. 11	Accounting	3
Hist. 13	U. S. History	
Hist. 25	or Eurpn. Hist.	3
Hist. 27	or Eurpn. Exp.	
Psych. 1	Psycholgoy	3
Fr. 11 or 21	French	
Ger. 3 or 9	or German	3
Span. 11 or 21	or Spanish	
Engl. 4, 6, or 10	or English	
Mil. 3	M. S. & T.	2
P.E. 3	Physical Ed.	—
M.R. Phil.	See page 177	—
		17

SECOND SEMESTER

Number	*Title*	*Cr.Hrs.*
Bus. 4	Economics	3
Bus. 12	Accounting	3
Hist. 14	U. S. History	
Hist. 26	or Eurpn. Hist.	3
Hist. 28	or Eurpn. Exp.	
Psych. 15	Ap. Psychology	3
Fr. 12 or 22	French	
Ger. 4 or 10	or German	3
Span. 12 or 22	or Spanish	
Engl. 5, 7, or 11	or English	
Mil. 4	M. S. & T.	2
P.E. 4	Physical Ed.	—
M.R. Phil.	See page 177	—
		17

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 21	Corp. Finance...	3	Bus. 22	Corp. Finance...	3
Bus. 29	Money & Banking	3	Bus. 30	Money & Banking	3
Bus. 45	Statistics	3	Bus. 46	Business Cycles.	3
Bus. 15	Cost Accounting	3	Bus. 16	Accounting Sys.	3
Bus. 49	or Econ. Geog.		Bus. 50	or Econ. Geog.	
Math. 41	or Math. of Fin.		Math. 42	or Math. of Stat.	
Govt. 51	American Govt.	3	Govt. 52	American Govt.	3
Govt. 157	or Mun. Man.		Govt. 158	or Mun. Man.	
	Elective	3		Elective	3
P.E. 5	Physical Ed. ...	—	P.E. 6	Physical Ed. ...	—
		18			18

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Any five of the following courses:			Any five of the following courses:		
Bus. 33	Labor Problems	15	Bus. 34	Labor Problems	15
Bus. 57	Marketing		Bus. 56	Business Law ..	
Bus. 107	Adv. Economics.		Bus. 58	Adv. & Selling..	
Bus. 113	Adv. Accounting		Bus. 108	Adv. Economics.	
Bus. 123	Investments ...		Bus. 114	Acct. Theory ..	
Bus. 131	Banking Policies		Bus. 126	Public Finance.	
Bus. 135	Public Utilities.		Bus. 132	Money Markets.	
Bus. 161	Sociology		Bus. 136	Public Utilities.	
I.E. 2	Industrial Man.		Bus. 162	Sociology	
Math. 43	Math. of Ins...		I.E. 3	Industrial Man.	
	Elective	3		Elective	3
P.E. 7	Physical Ed. ...	—	P.E. 8	Physical Ed. ...	—
		18			18

THE COLLEGE OF ENGINEERING

The College of Engineering offers curricula in

Chemical Engineering
Chemistry
Civil Engineering
Electrical Engineering
Engineering Physics
Industrial Engineering
Mechanical Engineering
Metallurgical Engineering
Mining Engineering
Sanitary Engineering

The Curricula

The engineering curricula were formulated on the basis of an intensive study, by the faculty of Lehigh University, of the problems of technical education and the changing needs of modern industry. This study led to the conclusion that greater emphasis than heretofore should be placed upon the fundamentals of engineering, including mathematics, physics, chemistry, and theoretical and applied mechanics, and less emphasis upon the highly specialized details of engineering practice; and that the engineer must know something of the social sciences, that is, the sciences which deal with human relations, and be familiar with the methods of business organization and administration. The various engineering curricula are arranged accordingly, to increase the time devoted to fundamentals and to nontechnical subjects, which are a part of the equipment of every well educated man and which are now recognized as essential to the proper training of engineers because of their practical applications in industrial and business life.

Advanced courses in Military Science and Tactics are optional with other courses and must be approved by the curriculum head concerned.

Among the noteworthy features of the curricula the following may be mentioned:

(1) Provision is made for a uniform freshman year in the College of Engineering, so that no student is required to select

his specialized course of study until he is better prepared, after a year of college work, to choose wisely. The requirements in the sophomore year for the various curricula are similar although not entirely uniform. A student can, therefore, change from one curriculum to another at the close of the second year with little difficulty.

(2) The work of the first two years is fairly self-contained. To those who for one reason or another are unable to complete their engineering training, it affords preparation for careers as draftsmen, electricians, surveyors, shop foremen, or assistants in industrial laboratories or plants. Students who complete in full the work of the first two years and who then withdraw from the University are given a certificate of work completed.

(3) At the close of the second year a comprehensive examination is required on the work of the first two years. Students whose showing in this examination is unsatisfactory and whose work for the first two years has been poor may be advised to withdraw from the University or to change into other curricula better suited to their aptitudes and interests.

(4) Since the University recognizes that an engineer cannot be trained by purely academic process, the degree awarded upon graduation is Bachelor of Science in the particular division of engineering that has been studied, for example, B.S. in Civil Engineering. The successful completion of one year of graduate study leads to the degree of Master of Science in the particular division of engineering studied.

(5) Professional engineering degrees such as Civil Engineer (C.E.), Mechanical Engineer (M.E.), etc., are awarded to graduates of Lehigh University having the degree of Bachelor of Science in Civil Engineering, Bachelor of Science in Mechanical Engineering, etc., who have had not less than five years of acceptable practical experience in responsible charge of work after graduation, and who submit a suitable thesis. A candidate who has received a master's degree from Lehigh University is eligible for the professional degree on the same basis.

Engineering Conferences

Throughout the freshman year weekly conferences are held by the directors of curricula, in which groups of students must

go in turn for orientation, motivation, and vocational guidance. During the sophomore year these conferences are continued in the curriculum of the student's choice. By means of these conferences and by the appraisal made by each instructor throughout the freshman and sophomore years, an estimate of the student's aptitude for further engineering work is attempted.

The Uniform Freshman Year

An outline follows of the work of the freshman year, uniform for all engineering students. For schedules of the work of the upper three years, varying according to the several specialized curricula, see the subsequent pages.

FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Chem. 1 or 3	Chemistry	2	Chem. 8	Stoichiometry	1
Chem. 11 or 13	Chemistry Lab.	2	Chem. 20	Qual. Analysis	3
C.E. 1	Engr. Drawing	2	C.E. 2	Engr. Drawing	2
Engl. 1	English	3	Engl. 2	English	3
*Math. 2	Algebra	3	Math. 3	Analytic Geom.	3
Phys. 1 / Math. 20	Elem. Physics or Mechanics	4	Math. 20 / Phys. 1	Mechanics or Elem. Phys.	4
Mil. 1	M. S. & T.	2	Mil. 2	M. S. & T.	2
E.C. 1	Eng. Conferences	—	E.C. 2	Eng. Conferences	—
P.E. 1	Physical Ed.	—	P.E. 2	Physical Ed.	—
M.R.Phil.	See page 177	—	M.R.Phil.	See page 177	—
		18			18

SUMMER SESSION

For students who at the end of the freshman year elect Electrical Engineering, Engineering Physics, Industrial Engineering, Mechanical Engineering, Metallurgical Engineering, or Sanitary Engineering

C.E. 6......Land and Topographic Surveying....... 4

For students who elect Civil Engineering or Mining Engineering

C.E. 6......Land and Topographic Surveying....... 4
C.E. 7......Railroad Surveying 2

For students who elect Chemical Engineering or Chemistry there is no required summer session following the freshman year.

* A student who presents Advanced Algebra for admission is excused from taking Math. 2. If such a student has not presented entrance credit in Solid Geometry, he takes in the first semester Math. 16, Solid Geometry and Spherical Trigonometry (3). A student who presents for admission both Advanced Algebra and Solid Geometry should ordinarily elect Math. 3, Analytic Geometry, in his first semester.

Selection of Specialized Curricula

In the spring of his freshman year each engineering student must announce his selection of the particular engineering curriculum which he desires to continue. This announcement must be made by members of the class of 1937 not later than April 6, 1934.

Inspection Trips

Inspection trips to industrial plants are a required part of specific courses in the various curricula in engineering. Written reports or examinations are required. These trips are under the general direction and supervision of the faculty committee on Inspection Trips. They are generally held during the senior year and involve an average expense of about $25.00. The location of the University in the center of industrial activities of various kinds furnishes unusual opportunities for visits of inspection to engineering plants.

Combined Arts and Engineering Curricula

Students who can afford the extra time and money are urged to spend five years in their collegiate training and to cover the requirements for both the B.A. and the B.S. in Engineering degrees. Under the five-year plan a student registers in the College of Arts and Science for four years, earning the B.A. degree on completion of a program which includes, along with specific B.A. training, the fundamental mathematical, scientific, and engineering subjects of the engineering curriculum of his choice. The fifth year is spent in the College of Engineering, carrying on a program leading to the degree of B.S. in his selected branch of engineering. This is usually the senior year curriculum of the chosen branch of engineering.

An engineering student who decides at any stage of his course that he wishes to work for both the B.A. and B.S. degrees, may register in one of the colleges concerned for a period of years, and complete the combined requirements of both degrees in five or six years, depending upon the program followed before the decision is made. His curriculum is so arranged that the work for one degree may be finished at the end of a four-year period, and the work for the subsequent degree at the close of the fifth or sixth year.

THE CURRICULUM IN CHEMICAL ENGINEERING

The curriculum in Chemical Engineering is designed to prepare the student for the profession of chemical engineer, which includes the design, construction, operation, and management of manufacturing establishments in which chemical products are made. Such substances include paper, gasoline and other petroleum products, cement, coke, gas, dyes, electrochemical products, paints, rubber, leather, foods, and other substances. In addition to the primary requirement of chemistry in all its branches, the training of the chemical engineer includes a thorough knowledge of physics and mathematics, and a sound understanding of such fundamentals of chemical, mechanical, and electrical engineering as will make him a discriminating research, operating, or sales engineer.

After chemical investigations furnish a better understanding of known processes or develop novel processes or novel methods, it is the particular province of chemical engineering to carry them forward into industrial production. The curriculum is not planned to turn out a specialist restricted to any one type of product; the aim is rather to develop expertness in the sciences and fundamental unit manufacturing processes which underlie all chemical engineering. Some familiarity with factory methods under actual working conditions is acquired through contact with operations in nearby plants. Frequent visits for observation and report are made to manufacturing plants in the immediate neighborhood and in the Philadelphia and New York districts.

THE CURRICULUM IN CHEMICAL ENGINEERING

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Chem. 6	Adv. Chemistry	3	Chem. 7	Adv. Chemistry	3
Chem. 30	Quant. Analysis	3	Chem. 31	Quant. Analysis	3
Chem. 41	Quant. Anal. Conf.	1	Chem. 45	Quant. Anal. Conf.	1
Ger. 1 or 3	German	3	Ger. 2 or 4	German	3
Math. 4	Elem. Calculus	3	Math. 5	Inter. Calculus	3
Phys. 4	Mech., Light, & Sound	3	Phys. 6	Elec., Mag., & Heat	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
M.R.Phil.	See page 177	—	M.R.Phil.	See page 177	—
		19			19

SUMMER

Chem. 39....Assaying, Coal, Gas, and Oil Analysis......... 4

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Chem. 78	Chemical Eng.	3	Chem. 161	Organic Chem.	3
Chem. 160	Organic Chem.	4	Chem. 166	Org. Chem. Lab.	3
Chem. 165	Org. Chem. Lab.	2	E.E. 56	Electrical Mach.	2
Met. 23	Fer. Metallurgy	2	E.E. 57	Dynamo Lab.	1
Met. 83	Met. Problems	1	M.E. 29	Heat Engines	3
Ger. 7 / Biol. 52	German or Bacteriol.	3	Met. 24	Non-fer. Metal.	2
			Met. 84	Met. Problems	1
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		18			18

SUMMER

M.E. 24.....Engineering Laboratory 4
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Chem. 162 / Chem. 168	Adv. Org. Chem. or Industrial Biochemistry	2	Chem. 99	Research Lab.	2
			Chem. 138	Ind. Org. Anal.	3
			Chem. 147	Ind. Anal. Conf.	1
Chem. 180	Chem. Eng. Lab.	3	Chem. 179	History of Chem.	1
Chem. 190	Physical Chem.	3	Chem. 181	Chemical Eng.	3
Chem. 192	Electrochemistry	1	Chem. 185	Chem. Eng. Prac.	1
Chem. 195	Phys. Chem. Lab.	1	Chem. 191	Physical Chem.	2
Chem. 197	Elec. Chem. Lab.	1	Chem. 196	Phys. Chem. Lab.	1
C.E. 9	Mech. of Materials	3		Elective	3
	Elective	3	P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			
		17			17

THE CURRICULUM IN CHEMISTRY

The chemist needs a deep insight into the phenomena of matter and into the many processes in which matter undergoes change and their application to the industrial arts. The graduate in chemistry may use his education to discover and investigate hitherto unknown combinations of matter and of energy, or he may apply known facts and principles to new and useful purposes in manufacture or in the arts. In preparation for a professional career, the training is thorough in fundamentals and leads to a comprehensive understanding of the scientific and industrial achievements of chemistry.

The curriculum offers an education primarily in chemistry, with considerable training in related sciences. The modern conception of an education in chemistry includes a co-ordinate study of physics and mathematics. In addition to these so-called physical sciences, other studies, planned to aid and develop the thought-processes and culture of the student, are embodied in the curriculum. It is believed by many practicing chemists and industrial chemists that an undergraduate course such as this one which includes a liberal allotment of study in the humanities is the best preparation for a successful career both in pure science and in the business application of chemistry.

Without reducing the professional training in chemistry, physics, and mathematics, the curriculum can be adapted to include the educational training required for State certification toward teaching these sciences in public high schools.

Since the freshman and sophomore years of this curriculum and of the curriculum in Chemical Engineering are the same, it is possible for a student to change from one curriculum to the other at the end of either semester of the sophomore year.

Numerous supervised visits for study and report at large industrial plants in the immediate neighborhood and in the Philadelphia and New York districts are an integral part of the curriculum.

THE CURRICULUM IN CHEMISTRY

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

First Semester			Second Semester		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Chem. 6	Adv. Chemistry	3	Chem. 7	Adv. Chemistry	3
Chem. 30	Quant. Analysis	3	Chem. 31	Quant. Analysis	3
Chem. 41	Quant. Anal. Conf.	1	Chem. 45	Quant. Anal. Conf.	1
Ger. 1 or 3	German	3	Ger. 2 or 4	German	3
Math. 4	Elem. Calculus	3	Math. 5	Inter. Calculus	3
Phys. 4	Mech., Light, & Sound	3	Phys. 6	Elec., Mag., & Heat	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
M.R.Phil.	See page 177	—	M.R.Phil.	See page 177	—
		19			19

SUMMER

Chem. 39....Assaying, Coal, Gas, and Oil Analysis......... 4

JUNIOR YEAR

First Semester			Second Semester		
Bus. 3	Economics	3	Bus. 4	Economics	3
Chem. 78	Chemical Eng.	3	Chem. 161	Organic Chem.	3
Chem. 160	Organic Chem.	4	Chem. 166	Org. Chem. Lab.	3
Chem. 165	Org. Chem. Lab.	2	Engl. 5, 11 or 41	English	3
Engl. 4 or 6	English	3	Geol. 4 / Geol. 6 / Bus. 18	Gen. Geology..2 & Field Trips.1 or Accounting	3
Ger. 3 / Fr. 1	German or French	3	Ger. 4 / Fr. 2	German or French	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		18			18

SUMMER

Chem. 50....Industrial Employment
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

SENIOR YEAR

First Semester			Second Semester		
Chem. 162 / Chem. 168	Adv. Org. Chem. or Industrial Biochemistry	2	Chem. 99	Research Lab.	2
Chem. 180	Chem. Eng. Lab.	3	Chem. 138	Ind. Org. Anal.	3
Chem. 190	Physical Chem.	3	Chem. 147	Ind. Anal. Conf.	1
Chem. 192	Electrochemistry	1	Chem. 179	History of Chem.	1
Chem. 195	Phys. Chem. Lab.	1	Chem. 181	Chemical Eng.	3
Chem. 197	Elec. Chem. Lab.	1	Chem. 185	Chem. Eng. Prac.	1
Any two of the following:			Chem. 191	Physical Chem.	2
Biol. 1 / Biol. 52 / Bus. 25 / Met. 23 / Met. 83 / Phys. 160	Biology / Bacteriology / Corp. Finance / Ferrous Met..2 & Met. Prob.1 / Physics / Elective	6	Chem. 196	Phys. Chem. Lab.	1
			Biol. 153 / Bus. 18 / Met. 24 / Met. 84 / Phys. 161	Adv. Bacteriol. or Accounting or Non-fer Met.....2 & Met. Prob.1 or Physics or Elective	3
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		17			17

THE CURRICULUM IN CIVIL ENGINEERING

The purpose of this curriculum is to give instruction in those general and scientific subjects which form the foundation of all engineering, and a special training in the field of civil engineering, which includes the building of highways, railroads, harbors, docks and terminals, bridges, buildings, subways, tunnels, water supply and purification plants, sewerage systems and sewage disposal plants, water power developments and surveys. To enable the civil engineering graduate to deal with allied technical problems arising in most civil engineering projects of today, the curriculum includes certain special studies in the fields of mechanical and electrical engineering, geology, and metallurgy. Courses in economics, accounting, and finance have been added since it is essential that the graduate should have a knowledge of the fundamentals of business. While no program of humanistic subjects is included in the curriculum, it is expected that the non-technical elective work of the junior and senior years will be chosen with the purpose of gaining knowledge of the great and ever-pressing problems of human life, individual and social; accordingly all programs of elective studies must have the approval of the director of curriculum.

The work of the first three years deals chiefly with the scientific and mathematical basis of engineering practice. In the fourth year the application of these basic principles is studied in geodesy, in structural, hydraulic, sanitary, and transportation engineering, the major divisions of the wide field of civil engineering. Sanitary Engineering is highly specialized and the student who wishes to practise in this field should elect the curriculum in Sanitary Engineering.

The positions open to new graduates include those of inspector, timekeeper, and engineering assistant on construction work, instrument man on surveys, draftsman, computer, and engineering apprentice. The last named follows the course of study prescribed by some of the large structural steel and other engineering companies for their beginning engineers.

THE CURRICULUM IN CIVIL ENGINEERING

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
Bus. 3	Economics	3	Bus. 4	Economics	3
Geol. 3	Intro. Geology	2	Geol. 9	Eng. Geology	3
Geol. 6	Field Trips	1	Math. 5	Inter. Calculus	3
Math. 4	Elem. Calculus	3	Phys. 6	Elec., Mag., & Heat	3
Phys. 4	Mech., Light, & Sound	3	Phys. 7	Physics Lab.	1
Phys. 5	Physics Lab.	1	C.E. 16	Highway Eng.	3
C.E. 11	Railroads	3	Mil. 4	M. S. & T.	2
Mil. 3	M. S. & T.	2	E.C. 4	Eng. Conferences	—
E.C. 3	Eng. Conferences	—	P.E. 4	Physical Ed.	—
P.E. 3	Physical Ed.	—	M.R.Phil.	See page 177	—
M.R.Phil.	See page 177	—			
		18			18

JUNIOR YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
C.E. 8	Mech. of Materials	4	C.E. 12	Hydraulics	3
C.E. 10	Mat. Testing Lab.	1	C.E. 14	Hydraulics Lab.	1
E.E. 50	Dyn. & Motors	2	C.E. 15	Stresses	4
E.E. 51	Dynamo Lab.	1	E.E. 52	Alt. Currents	2
Math. 6	Adv. Calculus	3	E.E. 53	Dynamo Lab.	1
M.E. 29	Heat Engines	3	Math. 21	Anal. Mechanics	3
Elective (non-technical)		3	M.E. 19	Engineering Lab.	1
P.E. 5	Physical Ed.	—	Elective (non-technical)		3
			P.E. 6	Physical Ed.	—
		17			18

SUMMER

C.E. 29...... Industrial Employment
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

SENIOR YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
C.E. 118	Str. Theory	3	Bus. 18	Accounting	3
C.E. 119	Str. Design	3	C.E. 25	Foundations	2
C.E. 125	Reinf. Concrete	3	C.E. 133	Hyd. & W.P. Eng.	3
C.E. 126	Concrete Lab.	1	Met. 21	Eng. Metallurgy	2
C.E. 128	Sanitary Eng.	3	Met. 81	Met. Problems	1
C.E. 27	Contr. & Spec. or Elective	3	C.E. 134	Hydraulic Eng.	1
Elective (non-technical)		3	C.E. 122	Geodesy 3	
P.E. 7	Physical Ed.	—	C.E. 123	or R.R. & Ter. 3	
			C.E. 124	or Str. Th. .3	
			C.E. 131	or Adv. San. Eng. 3	3
			C.E. 132	or Adv. Hgy. Eng. 3	
			C.E. 50	or Thesis...3	
			Elective (non-technical)		3
			C.E. 40	Eng. Conference	—
			P.E. 8	Physical Ed.	—
		19			18

THE CURRICULUM IN ELECTRICAL ENGINEERING

The electrical engineer is one who understands the science and art of economically "directing the sources of electrical power in nature for the uses and conveniences of man." He may design, manufacture, install, or operate electrical machinery and appliances, manage plants and electric systems, or engage in the promotion of engineering projects.

The object of this curriculum is to give instruction in those general and scientific subjects which underlie all the branches of engineering, and to give special training in those technical and business subjects which experience shows are most essential to the equipment of the electrical engineer. In seeking to accomplish this object the department puts chief emphasis upon mastery of the mathematical-physical principles and thoroughness in the analysis of problems.

The curriculum includes a number of special studies in civil, mechanical, and metallurgical engineering, so that the graduate in electrical engineering is prepared not only to enter any of the branches of electrical engineering but also to deal with related problems in the other divisions of engineering. The electrical engineering graduate of today finds that professional advancement often lies through commercial, managerial, or executive channels. As superintendent or manager of electric light, power, railway, or communication properties he must be prepared to handle problems involving not merely material and technical details but human relations with workmen, capitalists, public utility commissioners, and the public. He must know something of the principles of accounting, economics, business law, and industrial management. A number of such studies have been introduced into the curriculum.

THE CURRICULUM IN ELECTRICAL ENGINEERING

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
E.E. 1	Principles of E.E.	1	E.E. 2	Direct Cur. Mach.	3
Math. 4	Elem. Calculus	3	E.E. 3	Elem. Dyn. Lab.	1
M.E. 22	Heat Engines	3	Math. 5	Inter. Calculus	3
Met. 21	Metallurgy	2	M.E. 23	Heat Engines	3
Met. 81	Met. Problems	1	Phys. 4	Mech., Light, & Sound	3
Phys. 6	Elec., Mag., & Heat	3	Phys. 5	Physics Lab.	1
Phys. 7	Physics Lab.	1	Engl.	English or Foreign Language	3
Engl.	English or Foreign Language	3	Mil. 4	M. S. & T.	2
Mil. 3	M. S. & T.	2	E.C. 4	Eng. Conferences	—
E.C. 3	Eng. Conferences	—	P.E. 4	Physical Ed.	—
P.E. 3	Physical Ed.	—	M.R.Phil.	See page 177	—
M.R.Phil.	See page 177	—			
		19			19

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Biol. 1	Biology	3	Bus. 4	Economics	3
Bus. 3	Economics	3	C.E. 13	Hydraulics	2
C.E. 9	Mech. of Materials	3	C.E. 14	Hydraulics Lab.	1
C.E. 10	Mat. Testing Lab.	1	E.E. 6	Adv. Alt. Cur.	3
E.E. 4	Alt. Currents	3	E.E. 8	Inter. Dyn. Lab.	2
E.E. 5	Inter. Dyn. Lab.	1	Math. 21	Anal. Mechanics	3
Math. 6	Adv. Calculus	3	Phys. 111	Adv. Elec. Lab.	1
Phys. 110	Adv. Elec. Lab.	1	Geol. 4	Gen. Geology..2	
P.E. 5	Physical Ed.	—	Geol. 6	& Field Trips.1	3
			Psych. 1	or Psychology	
			P.E. 6	Physical Ed.	—
		18			18

SUMMER

E.E. 24 ...... Industrial Employment
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp ... 3

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
E.E. 11	Adv. Dynamo Lab.	3	Bus. 18	Accounting	3
E.E. 15	E.E. Seminar	1	E.E. 16	E.E. Seminar	2
E.E. 112	A.C. Machinery	3	E.E. 19	Adv. Dynamo Lab.	2
E.E. 114	Elec. Stations	3	E.E. 118	Elec. Power Trans.	3
M.E. 21	Engineering Lab.	1	M.E. 25	Engineering Lab.	1
E.E. 121	Elec. Com.		Any two of the following:		
E.E. 23	or Thesis	3	E.E. 20	Elec. Traction	
E.E. 113	or Elec. Design		E.E. 23	Thesis	
Bus. 25	Corp. Finance		E.E. 126	Elec. Com.	6
Engl. 4	or English	3	E.E. 122	Elec. Transients	
Hist. 13	or History		Engl. 5	English	
Math.†		—	Math.†		—
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		17			17

† Students who have completed Math. 21 with high standing may elect Math. 111, 112, 122, 123, or 124 on approval of the director of the curriculum.

THE CURRICULUM IN ENGINEERING PHYSICS

The recognition of the economic value of scientific investigation and the realization that growth and expansion follow upon research have led to the establishment of research laboratories in every field of industry. Scientific research has assumed an importance as a basis of industry equal to the exploitation of natural resources and must in the future become increasingly important as natural resources diminish. The amazing expansion in the electrical industries is to a very large extent the result of research. The statement applies more or less to every major industry, among the products of which may be listed the incandescent lamp, the telephone, radio, automobile, airplane, talking movies, optical glass, and scientific instruments and equipment.

The Bureau of Standards, the Bureau of Mines, the Naval Research Laboratory, and other government laboratories are endeavoring to keep pace with the industrial needs of the country. The universities have reflected the spirit of the age in the expansion of research facilities and research productivity. In every field of industry, government service, and education there is an insistent demand for men trained in the methods and technique of research.

Three avenues are open to the trained physicist: (1) he may enter an industrial research laboratory; (2) he may enter one of the great government laboratories; (3) he may become a university teacher and investigator. The thorough training in fundamentals, coupled with the specialized knowledge obtained through research, is a qualification for administrative work in connection with the products of research.

THE CURRICULUM IN ENGINEERING PHYSICS

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
Bus. 3	Economics	3	Bus. 4	Economics	3
Ger. 1 or 3	German	3	Ger. 2 or 4	German	3
Math. 4	Elem. Calculus	3	Math. 5	Inter. Calculus	3
Phys. 6	Elec., Mag., & Heat	3	Phys. 4	Mech., Light, & Sound	3
Phys. 7	Physics Lab.	1	Phys. 5	Physics Lab.	1
Chem. 6	Adv. Chemistry.	3	Chem. 7	Adv. Chemistry.	3
Geol. 1a	or Mineralogy		Geol. 4	or Geology..2	
Mil. 3	M. S. & T.	2	Geol. 6	& Field Trips.1	
E.C. 3	Eng. Conferences	—	Mil. 4	M. S. & T.	2
P.E. 3	Physical Ed.	—	E.C. 4	Eng. Conferences	—
M.R.Phil.	See page 177	—	P.E. 4	Physical Ed.	—
			M.R.Phil.	See page 177	—
		18			18

JUNIOR YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
Math. 6	Adv. Calculus	3	Math. 21	Anal. Mechanics.	3
Phys. 110	Adv. Elec. Lab.	1	Phys. 111	Adv. Elec. Lab.	1
Phys. 122	Light	3	Phys. 126	Pyrometry	3
Phys. 162	Th. Elec. & Mag.	3	Phys. 163	Th. Elec. & Mag.	3
E.E. 50	Dyn. & Motors.2	3	E.E. 52	Alt. Currents..2	3
E.E. 51	& Dyn. Lab.1		E.E. 53	& Dyn. Lab.1	
M.E. 22	or Heat Eng.		M.E. 23	or Heat Eng.	
Ger. 3	German	3	Ger. 4	German	3
Fr. 1	or French		Fr. 2	or French	
	Elective	3		Elective	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		19			19

SUMMER

Phys. 50.....Industrial Employment
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

SENIOR YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
Phys. 124	El. Dis. in Gases.	3	Phys. 120	Electric Waves	3
Phys. 160	Mod. Theories	3	Phys. 161	Mod. Theories	3
Phys. 164	Advanced Lab.	2	Phys. 165	Advanced Lab.	2
C.E. 9	Mech. of Mat.	3	Chem. 191	Phys. Chem...2	3
Chem. 190	or Ph. Chem.3		Chem. 196	& Lab. 1	
Chem. 195	& Lab. 1		E.E. 122	or El. Trans.	
Geol. 111	or Field Geol.2		Geol. 110	or Str. Geol.2	
Geol. 114	& Str. Geol..2		Geol. 115	& Geol. Meth.2	
Math. 111	or Ad. Dif. Eq.		Math. 112	or Ad. Dif. Eq.	
Met. 21	or Eng. Met.2		Math. 124	or Theo. of Er.	
Met. 81	& Met. Prob.1		Met. 21	or Eng. Met.2	
	Electives	6	Met. 81	& Met. Prob.1	
P.E. 7	Physical Ed.	—		Electives	6
			P.E. 8	Physical Ed.	—
		17			17

THE CURRICULUM IN INDUSTRIAL ENGINEERING

Industrial engineering has to do with the organization, operation, and management of manufacturing plants, public utilities, and operating, holding, and management companies. Broadly considered, it covers the engineering aspects of plant location, plant layout, routing, production control, maintenance, stores, and inspection; the economic aspects of employment, employee training, promotion, wage payment, bonus, safety and welfare, insurance and old age pensions; and the commercial aspects of purchasing, marketing, credit, accounting, and finance.

Industrial enterprises depend on sound financing, adequate accounting, and intelligent forecasting of economic developments. Technical skill and engineering efficiency are primary requisites, but these alone are not sufficient. There is a demand by industry for men who have not only a thorough training in the fundamentals of engineering, but also a knowledge of the problems of accounting, finance, statistics, and management which every enterprise encounters. The object of the curriculum in Industrial Engineering is to add a knowledge of the basic facts of economics, finance, and management to the technical knowledge and scientific spirit that come from the study of engineering.

The curriculum in Industrial Engineering is primarily an engineering curriculum supplemented by courses in economics and business administration, so chosen as to provide a thorough training in the fundamental principles of economics, industrial management, corporation financing, and business practice. The curriculum is designed primarily to meet the needs of that considerable body of students who intend to enter industries essentially technical, whether public utilities or manufacturing plants, but who intend to go into the administrative departments.

THE CURRICULUM IN INDUSTRIAL ENGINEERING

For the classes of 1934, and 1935

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Math. 4	Elem. Calculus	3	Math. 5	Inter. Calculus	3
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
Phys. 6	Elec., Mag., & Heat	3	Phys. 4	Mech., Light, & Sound	3
Phys. 7	Physics Lab.	1	Phys. 5	Physics Lab.	1
Engl.	English or Foreign Language	3	Engl.	English or Foreign Language	3
Govt. 51	or Amer. Govt.		Govt. 52	or Amer. Govt.	
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
M.R.Phil.	See page 177	—	M.R.Phil.	See page 177	—
		18			18

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 11	Accounting	3	Bus. 12	Accounting	3
Bus. 21	Corp. Finance	3	Bus. 22	Corp. Finance	3
Bus. 29	Money & Banking	3	Bus. 30	Money & Banking	3
C.E. 9	Mech. of Materials	3	C.E. 13	Hydraulics	2
M.E. 22	Heat Engines	3	C.E. 14	Hydraulics Lab.	1
M.E. 30	Mechanism	3	E.E. 50	Dyn. & Motors	2
P.E. 5	Physical Ed.	—	E.E. 51	Dynamo Lab.	1
			M.E. 10	Thermodynamics.	3
			P.E. 6	Physical Ed.	—
		18			18

SUMMER

I.E. 1	Industrial Employment	
Mil. 9 or 19	or Reserve Officers' Training Corps Camp	3

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 33	Labor Problems	3	Bus. 56	Business Law	3
Bus. 45	Statistics	3	Bus. 126	Public Finance	3
E.E. 52	Alt. Currents	2	E.E. 54	Electrical Eng.	2
E.E. 53	Dynamo Lab.	1	E.E. 55	Dynamo Lab.	1
I.E. 2	Industrial Man.	3	I.E. 3	Industrial Man.	3
Met. 21	Metallurgy	2	I.E. 4	Industrial Power.	3
Met. 81	Met. Problems	1		Elective	3
	Elective	3	P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			
		18			18

THE CURRICULUM IN INDUSTRIAL ENGINEERING

Effective for the classes of 1936, 1937, and 1938

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
Bus. 3	Economics	3	Bus. 4	Economics	3
Math. 4	Elem. Calculus	3	Math. 5	Inter. Calculus	3
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
M.E. 2	El. Heat Engines	3	M.E. 5	Heat Engines	3
Phys. 4	Mech., Light, & Sound	3	Phys. 6	Elec., Mag., & Heat	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
M.R.Phil.	See page 177	—	M.R.Phil.	See page 177	—
		18			18

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
	Arts Option	3		Arts Option	3
Bus. 25	Corp. Finance	3	Bus. 18	Accounting	3
Bus. 29	Money & Banking	3	Bus. 30	Money & Banking	3
E.E. 50	Dyn. & Motors	2	C.E. 10	Mat. Testing Lab.	1
E.E. 51	Dynamo Lab.	1	C.E. 17	Mech. of Materials	2
Met. 21	Metallurgy	2	M.E. 21	Engineering Lab.	1
Met. 81	Met. Problems	1	M.E. 33	Thermodynamics.	2
Psych. 1	Psychology	3	Psych. 15	Psychology	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		18			18

SUMMER

I.E. 1 .... Industrial Employment
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp ... 3

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
	Business Option.	3		Business Option.	3
Bus. 45	Statistics	3	Bus. 46	Business Cycles	3
E.E. 52	Alt. Currents	2	I.E. 3	Industrial Man.	3
E.E. 53	Dynamo Lab.	1	M.E. 31	Appl. Mechanics.	3
I.E. 2	Industrial Man.	3	Mine. 15	Mining Eng.	3
M.E. 25	Engineering Lab.	1			
M.E. 34	Thermodynamics.	2			
	Elective	3		Elective	3
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		18			18

THE CURRICULUM IN MECHANICAL ENGINEERING

Mechanical engineering deals with the design, construction, installation, and operation of machinery necessary for the economical and advantageous use of power, and with the management of industries and organizations manufacturing and using power-driven equipment. The young graduate ordinarily goes into a graduate apprenticeship in some public utility, manufacturing, or selling organization, from which he may work up to a position as power engineer, works manager, sales engineer, engineering designer, or executive officer.

The freshman and sophomore years of the curriculum are concerned largely with the fundamentals of mathematics, physics, chemistry, and engineering drawing. Machine design and heat engines are begun in the sophomore year. More advanced mechanical engineering subjects include engineering laboratory, thermodynamics, mechanism, advanced heat engines, and advanced machine design. Among the topics considered are fuels, combustion, steam boilers and furnaces, properties of steam, power plant auxiliaries, steam engines, steam turbines, internal combustion engines, power plants, refrigeration, heating and ventilation, pumps, air compressors, and machine tools. Comprehensive tests are made of boilers, power plants, and pumping stations in the neighborhood. Experimental work in engineering laboratory is required throughout the junior and senior years.

THE CURRICULUM IN MECHANICAL ENGINEERING

For the classes of 1934 and 1935

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Math. 4	Elem. Calculus	3	Math. 5	Inter. Calculus	3
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
M.E. 2	Elem. Heat Eng.	3	M.E. 5	Heat Engines	3
Phys. 6	Elec., Mag., & Heat	3	Phys. 4	Mech., Light, & Sound	3
Phys. 7	Physics Lab.	1	Phys. 5	Physics Lab.	1
Engl.	English or Foreign Language	3	Engl.	English or Foreign Language	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
M.R.Phil.	See page 177	—	M.R.Phil.	See page 177	—
		18			18

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
C.E. 9	Mech. of Materials	3	E.E. 50	Dyn. & Motors	2
C.E. 10	Mat. Testing Lab.	1	E.E. 51	Dynamo Lab.	1
Math 6	Adv. Calculus	3	Math. 21	Anal. Mechanics.	3
M.E. 9	Engineering Lab.	1	M.E. 6	Mechanism	4
M.E. 10	Thermodynamics.	3	M.E. 11	Engineering Lab.	1
Met. 21	Metallurgy	2	M.E. 108	Heat Engines	3
Met. 33	Metallurgy Lab.	1	Met. 34	Metallurgy Lab.	1
Met. 81	Met. Problems	1	P.E. 6	Physical Ed.	—
P.E. 5	Physical Ed.	—			
		18			18

SUMMER

I.E. 1 .... Industrial Employment
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp ... 3

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
C.E. 13	Hydraulics	2	EE. 54	Electrical Eng.	2
C.E. 14	Hydraulics Lab.	1	E.E. 55	Dynamo Lab.	1
E.E. 52	Alt. Currents	2	M.E. 116	Adv. Design	4
E.E. 53	Dynamo Lab.	1	M.E. 117	Adv. Mech. Eng.	3
M.E. 112	Adv. Design	4	M.E. 118	Engineering Lab.	2
M.E. 113	Adv. Mech. Eng.	3	Engl. 41 or 42	English	
M.E. 114	Engineering Lab.	2	M.E. 15	or Thesis	3
Bus. 25	Corp. Finance			or Elective	
Bus. 45	or Statistics	3	Bus. 18	Accounting	
I.E. 2	or Ind. Man.		Bus. 56	or Bus. Law	3
P.E. 7	Physical Ed.	—	I.E. 3	or Ind. Man.	
			P.E. 8	Physical Ed.	—
		18			18

THE CURRICULUM IN MECHANICAL ENGINEERING

Effective for the classes of 1936, 1937, and 1938

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Math. 4	Elem. Calculus	3	Math. 5	Inter. Calculus	3
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
M.E. 2	El. Heat Engines	3	M.E. 5	Heat Engines	3
Phys. 4	Mech., Light, & Sound	3	Phys. 6	Elec., Mag., & Heat	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
M.R.Phil.	See page 177	—	M.R.Phil.	See page 177	—
		18			18

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
	Arts Option	3		Arts Option	3
Bus. 25	Corp. Finance	3	E.E. 50	Dyn. & Motors	2
C.E. 10	Mat. Testing Lab.	1	E.E. 51	Dynamo Lab.	1
C.E. 17	Mech. of Materials	2	Math. 21	Anal. Mechanics	3
Math. 6	Adv. Calculus	3	M.E. 11	Engineering Lab.	1
M.E. 9	Engineering Lab.	1	M.E. 32	Appl. Mechanics	3
M.E. 31	Appl. Mechanics	3	M.E. 34	Thermodynamics	2
M.E. 33	Thermodynamics	2	Met. 21	Metallurgy	2
P.E. 5	Physical Ed.	—	Met. 81	Met. Problems	1
			P.E. 6	Physical Ed.	—
		18			18

SUMMER

I.E. 1 .... Industrial Employment

Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
C.E. 12	Hydraulics	3	Bus. 18	Accounting	3
E.E. 52	Alt. Currents	2	E.E. 54	Electrical Eng.	2
E.E. 53	Dynamo Lab.	1	E.E. 55	Dynamo Lab.	1
M.E. 113	Adv. Mech. Eng.	3	M.E. 117	Adv. Mech. Eng.	3
M.E. 114	Engineering Lab.	2	M.E. 118	Engineering Lab.	2
M.E. 121	Adv. Mach. Des.	3	M.E. 122	Adv. Mach. Des.	3
Met. 33	Metallurgy Lab.	1	Met. 34	Metallurgy Lab.	1
	Elective	3		Elective	3
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		18			18

THE CURRICULUM IN METALLURGICAL ENGINEERING

The object of this curriculum is the preparation of the student for practice in engineering generally, and particularly in the fields of metallurgy. These cover three general types of practice, namely: (1) the production, refining, and preparation for use of the metals and alloys, such as iron, steel, copper, lead, zinc, aluminum, etc.; (2) the intelligent use of all metals and alloys in industries, for structures, railroads, automobiles, airplanes, machinery, vehicles, pipe, tools, hardware, ordnance, wire products, etc.; (3) the so-called "service" or "sales" division of industry. The day has passed when sales departments can carry on their work without the aid of trained engineers; problems must be discussed with customers which only a man thoroughly trained technically and entirely familiar with the customers' engineering needs and the possibilities of filling these needs with metals or alloys, can intelligently handle. In addition, some aspects of each department of engineering—chemical, physical, civil, electrical, industrial, mechanical, and mining—are studied briefly.

The metallurgy courses include a development of the basic principles of chemistry, physics, mathematics, and economics as applied to metallurgy. In addition, the student is familiarized with the most modern practice in each division of metallurgy. This instruction is co-ordinated with visits to plants manufacturing or using metals or alloys. For this purpose, Bethlehem, the center of one of the largest industrial districts in the world, is well situated.

An option in Electrometallurgy is offered, in which the following schedule for the senior year is substituted for the senior year schedule on the following page.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Met. 3	Met. of Copper Lead, etc.	2	E.E. 54	Electrical Eng.	2
Met. 131	Metallography	3	E.E. 55	Dynamo Lab.	1
Met. 132	Metallurgy Lab.	2	Met. 4	Met. of Zinc, Aluminum, etc.	2
Met. 137	Seminar	1	Met. 108	Electrometallurgy	3
Met. 163	Met. Problems	1	Met. 138	Seminar	2
Phys. 124	Elec. Discharge	3	Met. 90	Thesis	2
Mine. 3 / Chem. 134 / Chem. 144	Ore Dressing or Rad. Meth. 2 & Rad. Lab. 1	3	Geol. 108 / Chem. 135 / Chem. 145	Economic Geol. or Rad. Meth. 2 & Rad. Lab. 1	3
	Elective	3		Elective	3
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		18			18

THE CURRICULUM IN METALLURGICAL ENGINEERING

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Chem. 33	Quant. Analysis	3	Geol. 4	General Geology	2
Chem. 44	Quant. Anal. Conf.	1	Geol. 6	Field Trips	1
Math. 4	Elem. Calculus	3	Math. 5	Inter. Calculus	3
Met. 1	Gen. Metallurgy	2	Met. 33	Metallurgy Lab.	1
Phys. 4	Mech., Light, & Sound	3	Met. 61	Met. Problems	1
Phys. 5	Physics Lab.	1	Phys. 6	Elec., Mag., & Heat	3
Ger. 1 or 3 / Fr. 1 or 11	German or French	3	Phys. 7	Physics Lab.	1
Mil. 3	M. S. & T.	2	Ger. 2 or 4 / Fr. 2 or 12	German or French	3
E.C. 3	Eng. Conferences	—	Mil. 4	M. S. & T.	2
P.E. 3	Physical Ed.	—	E.C. 4	Eng. Conferences	—
M.R. Phil.	See page 177	—	P.E. 4	Physical Ed.	—
			M.R. Phil.	See page 177	—
		18			17

SUMMER

*Chem. 39....Assaying, Coal, Gas, and Oil Analysis......... 4
Met. 48...... or Industrial Employment

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Chem. 6	Adv. Chemistry	3	Chem. 98	Physical Chem.	2
C.E. 9	Mech. of Materials	3	E.E. 52	Alt. Currents	2
C.E. 10	Mat. Testing Lab.	1	E.E. 53	Dynamo Lab.	1
E.E. 50	Dyn. & Motors	2	M.E. 29	Heat Engines	3
E.E. 51	Dynamo Lab.	1	Met. 2	Met. of I. & S.	2
Geol. 1a	Mineralogy	3	Met. 44	Plant Visits	1
Met. 125	Electrochemistry	2	Met. 62	Met. Problems	1
Met. 135	Elec. Chem. Lab.	1	Met. 130	Physical Met.	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		19			18

SUMMER

Met. 49......Industrial Employment
Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Met. 3	Met. of Copper, Lead, etc.	2	M.E. 19	Engineering Lab.	1
Met. 131	Metallography	3	Met. 4	Met. of Zinc, Aluminum, etc.	2
Met. 132	Metallurgy Lab.	2	Met. 46	Plant Visits	1
Met. 137	Seminar	1	Met. 138	Seminar	2
Met. 163	Met. Problems	1	Met. 152	Adv. Met. I. & S.	2
Mine. 3 / Chem. 134 / Chem. 144	Ore Dressing or Rad. Meth. 2 & Rad. Lab. 1	3	Met. 164	Met. Problems	1
	Electives	6	Geol. 108 / Chem. 135 / Chem. 145	Economic Geol. or Rad. Meth. 2 & Rad. Lab. 1	3
P.E. 7	Physical Ed.	—		Electives	6
			P.E. 8	Physical Ed.	—
		18			18

* Not required of students who take C.E. 6 at end of the freshman year.

THE CURRICULUM IN MINING ENGINEERING

Mining engineering has to do with the extraction of raw materials of economic value from the earth and their preparation for the needs of modern civilization. Mining, therefore, constitutes one of the great basic industries of the present age, as all industries are absolutely dependent upon it, in greater or less degree, for their supplies of metals, coal, petroleum, gas, stone, cement, building materials, and other mineral products which are used in the arts and in manufacturing.

The actual work of mining itself constitutes but a part of the duties which devolve upon the mining engineer, and much of his activity is divided among the broader problems concerning geology, exploration, plant construction, operation and maintenance, transportation, ore treatment and reduction, coal preparation, oil and gas technology, and general administration.

The basic scientific training is given during the first and second years, and includes mathematics, physics, chemistry, mineralogy, geology, with laboratory work; the special technical training is received during the third and fourth years, and includes instruction in mechanics of materials, hydraulics, fuels, generation and utilization of power, metallurgy, economic geology, construction, mining, coal and ore preparation, economics and allied business subjects.

Mining engineers have contributed in large degree to the phenomenal growth in wealth and power of the United States and of the Latin American countries and, as in the past, still continue to be the most important factors in the exploitation and development of the mineral resources of practically every country in the world.

As the fields in which a mining engineer operates present a wide variety of problems, his specific technical training, as influenced by his personal aptitudes, should be directed in general along one of the following lines of activity: mine operation, mining geology, mineral preparation, metallurgy, fuels, construction, or administration. To meet these requirements, the curriculum here presented offers the corresponding elective courses.

THE CURRICULUM IN MINING ENGINEERING

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Chem. 36	Quant. Analysis..	2	Chem. 37	Quant. Analysis..	2
Chem. 48	Quant. Anal. Conf.	1	Chem. 49	Quant. Anal. Conf.	1
Geol. 1	Mineralogy	4	Geol. 4	Geology	2
Math. 4	Elem. Calculus..	3	Geol. 5	Petrology	1
M.E. 22	Heat Engines	3	Geol. 6	Field Trips	1
Phys. 4	Mech., Light, & Sound	3	Math. 5	Inter. Calculus..	3
Phys. 5	Physics Lab.	1	M.E. 23	Heat Engines	3
Mil. 3	M. S. & T.	2	Phys. 6	Elec., Mag., & Heat	3
E.C. 3	Eng. Conferences	—	Phys. 7	Physics Lab.	1
P.E. 3	Physical Ed.	—	Mil. 4	M. S. & T.	2
M.R. Phil.	See page 177	—	E.C. 4	Eng. Conferences	—
			P.E. 4	Physical Ed.	—
			M.R. Phil.	See page 177	—
		19			19

SUMMER

Chem. 39....Assaying, Coal, Gas, and Oil Analysis......... 4

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
C.E. 9	Mech. of Materials	3	C.E. 13	Hydraulics	2
CE. 10	Mat. Testing Lab.	1	C.E. 14	Hydraulics Lab..	1
Geol. 112	Petrography	2	Engl. 41 or 42	English	3
Mine. 1	Mining Eng.	3	Met. 21	Metallurgy	2
Mine. 2	Mining Methods.	3	Met. 81	Met. Problems	1
Mine. 3	Ore Dress., Coal Prep. & Lab.	3	Mine. 5	Mining Eng.	3
			Mine. 6	Mine Surveying..	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		18			18

SUMMER

Mine. 20.....Industrial Employment

Mil. 9 or 19 .. or Reserve Officers' Training Corps Camp... 3

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
E.E. 50	Dyn. & Motors..	2	E.E. 52	Alt. Currents	2
E.E. 51	Dynamo Lab.	1	E.E. 53	Dynamo Lab.	1
Geol. 7	Economic Geology	2	Geol. 108	Economic Geology	3
Geol. 111	Field Geology	2	Mine. 8	Oil Field Prac.	2
Ten credit hours from following:		10	Nine credit hours from following:		9
Biol. 52	Bacteriology ..3		Bus. 18	Accounting ...3	
Bus. 25	Corp. Finance.3		Bus. 56	Bus. Law.....3	
C.E. 20	Str. Theory...2		C.E. 16	Highway Eng.3	
C.E. 125	Reinf. Con....3		C.E. 30	Str. Design....3	
C.E. 126	Cement Lab...1		Geol. 109	Paleontology ..3	
Geol. 8	Hist. Geology.3		Geol. 110	Stratigraphy ..2	
Geol. 114	Str. Geology...2		Geol. 115	Geol. Method..2	
I.E. 2	Ind. Man.....3		I.E. 3	Ind. Man. 3	
M.E. 21	Engine Lab...1		M.E. 25	Engine Lab...1	
Met. 3	Metallurgy ...2		Met. 4	Metallurgy ...2	
Met. 125	Electrochem. .2		Mine. 9	Mine Adm. & Law 1	
Mine. 7	Construction .2		Mine. 11	Fuel Tech....2	
Mine. 10	Fuel Tech....2		Mine. 13	Fuel Tech. Lab.1	
Mine. 12	Fuel Tech. Lab.1		Span. 2 or 12	Spanish 3	
Span. 1 or 11	Spanish 3				
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		17			17

SANITARY ENGINEERING

The curriculum in Sanitary Engineering is designed to develop an engineer competent in the design, construction, and operation connected with water-supply and sewage-disposal, and also the many other engineering projects which have to do with the treatment and utilization of varied industrial wastes which have arisen in the expansion of modern industry. These objectives are accomplished by including in this curriculum a development in chemistry and chemical engineering as large as that in civil engineering. The wider vision attained will encompass the control and purification of wastes and rejected products from mines, coking plants, metallurgical industries, chemicals plants, wood-pulp and paper industries, dye houses, bleacheries and laundries, tanneries, electroplating works, food-manufacture and dairying plants, and the like. With the equipment afforded it is proposed to train an engineer and scientist who is peculiarly fitted for the varied duties attendant on municipal engineering and management. He will be prepared to undertake the engineering activities in connection with city bureaus of water, health, parks, and public property, and the office of the city engineer.

Collateral training is provided in other fields of science and engineering, such as physics, mathematics, biology, geology, bacteriology, analytical chemistry, highway engineering, electrical engineering, and mechanical engineering. The district near the University abounds in newer types of water-works, sewage installation, waste-disposal operations of many types, all of which are available for inspection and study. Visits are also made to installations in other great manufacturing and civic centers.

In the broader aspects of policy and administration this curriculum is under the coordinate direction of the department of Civil Engineering and the department of Chemistry and Chemical Engineering. The details of administration are delegated to the department of Civil Engineering.

By spending an additional year in this University a graduate of this curriculum can arrange to complete the requirement for the degree of B.S. in either of the two cooperating departments, Civil Engineering or Chemical Engineering.

THE CURRICULUM IN SANITARY ENGINEERING

FRESHMAN YEAR

See page 56.

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Chem. 30	Quant. Analysis.	3	Chem. 31	Quant. Analysis.	3
Chem. 41	Quant. Anal. Conf.	1	Chem. 45	Quant. Anal. Conf.	1
Geol. 3	Intro. Geology	2	Geol. 9	Eng. Geology	3
Geol. 6	Field Trips	1	Math. 5	Inter. Caculus	3
Math. 4	Elem. Calculus	3	Phys. 6	Elec., Mag., & Heat	3
Phys. 4	Mech., Light, & Sound	3	Mil. 4	M. S. & T.	2
Mil. 3	M. S. & T.	2	E.C. 4	Eng. Conferences	—
E.C. 3	Eng. Conferences	—	P.E. 4	Physical Ed.	—
P.E. 3	Physical Ed.	—	M.R.Phil.	See page 177	—
M.R.Phil.	See page 177	—			
		18			18

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Biol. 1	Biology	3	Biol. 50	San. Bacteriology.	3
Chem. 78	Chemical Eng.	3	Chem. 161	Organic Chem.	3
Chem. 160	Organic Chem.	4	C.E. 15a	Stresses	3
C.E. 9	Mech. of Mat.	3	E.E. 56	Elec. Machinery.	2
C.E. 14	Hydraulics Lab.	1	E.E. 57	Dynamo Lab.	1
Elective (non-technical)		3	M.E. 29	Heat Engines	3
P.E. 5	Physical Ed.	—	Elective (non-technical)		3
			P.E. 6	Physical Ed.	—
		17			18

SUMMER

M.E. 24	Engineering Laboratory	4
Mil. 9 or 19	or Reserve Officers' Training Corps Camp	3

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Chem. 99	Research Lab.	2	Chem. 138	Ind. Org. Anal.	2
Chem. 168	Ind. Biochemistry	2	Chem. 147	Ind. Anal. Conf.	2
Chem. 169	Ind. Biochem. Lab.	1	Chem. 170	Ind. Biochemistry	3
C.E. 118	Structures	3	Chem. 185	Chem. Eng. Prac.	1
C.E. 125	Reinf. Concrete	3	C.E. 16a	Highway Eng.	2
C.E. 126	Concrete Lab.	1	C.E. 25	Foundations	2
C.E. 128	Sanitary Eng.	3	C.E. 131	Adv. San. Eng.	3
Elective (non-technical)		3	C.E. 133	Hyd. & W.P. Eng.	3
P.E. 7	Physical Ed.	—	C.E. 134	Hydraulic Eng.	1
			P.E. 8	Physical Ed.	—
		18			19

DESCRIPTION OF COURSES

Following is a list of the undergraduate and graduate courses offered by Lehigh University. The number of exercises a week in each subject is indicated by the figures in parentheses. Three hours of drawing, of work in the laboratory, or of practice in the field are regarded as equivalent to a recitation or lecture of one hour's duration.

Prerequisites

Prerequisites are of two kinds: primary prerequisites which are strictly essential; secondary prerequisites which are highly desirable but not absolutely essential. Secondary prerequisites may be waived by the head of the department concerned. In the following description of courses, primary prerequisites are printed in italics and secondary prerequisites in Roman type.

ASTRONOMY

See Mathematics and Astronomy

ATHLETICS

See Physical Eduation

BIOLOGY

PROFESSORS HALL AND S. J. THOMAS, MR. TREMBLY

Biol. 1. Biology. Recitations, lectures, and laboratory work. The recitations and lectures deal with the following topics: (a) fundamental conceptions: life, protoplasm, the cell, etc.; (b) the animal phyla; (c) the more important biological theories: variation, heredity, evolution, etc. In the laboratory, types of the various phyla are studied. Fee, $3.00. First semester (3).

Biol. 2. Mammalian Anatomy. Two laboratory periods a week, the work consisting of the detailed dissection of a mammal. Prerequisite: Biol. 1 or its equivalent. Fee, $5.00. Second semester (2).

Biol. 3. Comparative Anatomy of Vertebrates. Laboratory work and recitations on the comparative anatomy of verte-

brates; laboratory work consisting of the dissection of types of the several vertebrate classes. Prerequisite: Biol. 1 or its equivalent. Fee, $3.00. Second semester (3).

Biol. 6. Botany. A survey of the subject designed to give the student a general knowledge of plant life, morphology, physiology, and the classification of the vegetable kingdom. Type species studied in the laboratory and field trips to familiarize the student with plant habitats. Second semester (3).

Biol. 7. Elementary Biology. A recitation survey course dealing with the characteristics and the history of living organisms. Special emphasis is laid on the evolution of the lower forms of animal life. Biol. 7 and Biol. 8 form a continuous course and should not be taken separately. First semester (3).

Biol. 8. Elementary Biology. Continuation of Biol. 7. The more advanced theories of genetics, eugenics, and human evolution. Prerequisite: Biol. 1 or 7. Second semester (3).

Biol. 9. Genetics. The laws and the mechanism of heredity; eugenics. Prerequisite: Biol. 1 or its equivalent. Second semester (1).

Biol. 15. Freshman Hygiene. A course of four lectures on social hygiene, with the cooperation of the Director of the Students' Health Service. This course is given during freshman week. Biol. 15 is required of all students. Either this course or Biol. 16 must be passed before graduation.

Biol. 16. Social Hygiene. A course for students who for any reason have not taken or have not passed Biol. 15. Second semester.

Biol. 21. Hygiene. Physiology and anatomy of the human body. The evolution and development of organs and systems. Their structures, functions, and interrelationships are studied as a scientific basis for appropriate attitudes and habits concerning health. A recitation course. First semester (3).

Biol. 50. Sanitary Bacteriology. Study of bacteria and allied microörganisms by staining and cultural methods; their sanitary importance in public water supplies; the bacteriology of sewage and sewage treatment; qualitative and quantitative bacteriological and biological analysis of water and sewage.

Lectures, recitations, and laboratory work. Fee, $3.00. Second semester (3).

Biol. 52. Bacteriology. An elementary course in general bacteriology. A general study of the morphological and cultural characteristics of bacteria and allied microörganisms; special attention given to those forms of sanitary and economic importance; the role of bacteria, yeasts, and molds in fermentation industries, in water and milk, and in disease. Lectures, recitations, and laboratory work. Fee, $3.00. First semester (3).

Biol. 54. Bacteriology. A course in elementary bacteriology especially designed for pre-medical students and others specializing in biological sciences. Laboratory work including special staining methods in the study of morphology; differential media in the study of bacterial physiology; and in general a more thorough study of the microörganisms themselves rather than their specific sanitary or industrial importance. Recitations, lectures, and laboratory work. Fee, $3.00. First semester (3).

For Advanced Undergraduates and Graduates

Biol. 104. Vertebrate Embryology. A lecture, recitation, and laboratory course on the development of vertebrates. The laboratory work is based mainly on the embryology of an amphibian and the chick, demonstrating the successive stages of cleavage, gastrulation, germ layer formation, and the development of tissues and organs. Prerequisites: *Biol. 1 or its equivalent;* Biol. 3. First semester (3). Professor Hall.

Biol. 113. Histology. Two recitation periods and one three-hour laboratory period. A thorough course in the technique of fixing, cutting, and differential staining of animal tissue, and the training in the recognition of various normal human tissues. Prerequisite: Biol. 1 and 3 or their equivalent. Fee, $3.00. Second semester (3). Mr. Trembley.

Biol. 153. Advanced Bacteriology. A laboratory and recitation course in medical bacteriology; a thorough cultural study of the more common pathogenic bacteria; bacteriological laboratory diagnosis of pathological fluids. Prerequisite: Biol. 50, 52, or 54. Fee, $3.00. Second semester (3). Professor Thomas.

Biol. 158. Immunology. A comprehensive recitation course in the history of the study of immunity and modern theories concerning its mechanism. Prerequisite: Biol. 153 either previously or concurrently. Second semester (3). Professor Thomas.

For Graduates

Prerequisite for graduate work in biology: the amount of biology usually obtained by an undergraduate majoring in that department. Prerequisite for graduate work in bacteriology: a satisfactory course in undergraduate bacteriology and a sufficient preparation in organic chemistry. Ability to undertake graduate work in bacteriology must be demonstrated by previous scholastic record, an examination, or both.

Biol. 203. Vertebrate Histogenesis and Organogenesis. Careful following, in the laboratory, of the development of a vertebrate; tracing of the history of the germ-layers, organs, and tissues; organogenesis dealing with the association of tissues to form organs. First semester (3). Professor Hall.

Biol. 205. History of Biology. A course based on reading, seminars, and written reports. First or second semester (2). Professor Hall.

Biol. 206. Biological Theories. A course dealing especially with genetics. First or second semester (2). Professor Hall.

Biol. 207. Biological Research. In this course a student may pursue investigations in such subjects as embryology, comparative anatomy, genetics, etc., according to his preparation and interests. First semester (3). Professor Hall.

Biol. 208. Biological Research. Continuation of Biol. 207. Second semester (3). Professor Hall.

Biol. 251. Bacteriological Research. In this course competent graduate students are given laboratory problems to be worked out under the supervision of the professor of bacteriology. Prerequisites: Biol. 50, 52, or 54; 153, and at least one semester of organic chemistry. First semester (3). Professor Thomas.

Biol. 252. Bacteriological Research. Continuation of Biol. 251. Second semester (3). Professor Thomas.

Biol. 253. Bacteriological Research. May be taken simultaneously with Biol. 251 by graduate students majoring in bacteriology. First semester (2). Professor Thomas.

Biol. 254. Bacteriological Research. May be taken simultaneously with Biol. 252 by graduate students majoring in bacteriology. Biol. 253 and 254 are given only to graduate students who are majoring in bacteriology. Biol. 251 and its continuation, Biol. 252, may be taken by graduate students minoring in bacteriology. Second semester (2). Professor Thomas.

Biol. 255. Industrial Bacteriology. An advanced course in bacteriology including aspects of industrial chemistry in which bacteria play an essential part in the process, as in the manufacture of acetone, butyl alcohol, acetic and lactic acids, etc. A study of the common contaminating organisms which cause commercial losses in the manufacture of sugar, leather, etc. Prerequisite: Biol. 52 or 54. First semester (3). Professor Thomas.

Biol. 260. Serology. A laboratory course in the preparation of antigens, immunization of animals, and the study of immune products such as agglutinins, precipitins, bacteriotropins, lysins, etc. To be taken by graduate students concurrently with or following Biol. 158. Prerequisite: Biol. 153 either previously or concurrently. First or second semester (3). Professor Thomas.

Biol. 261. Advanced Public Sanitation. A study of the biological, chemical, bacteriological, and physical aspects of public water supplies, systems of sewage disposal, and milk distribution. Prerequisites: at least two years of chemistry, including quantitative analysis, Biol. 50, 52, or 54. First or second semester (3). Professor Thomas.

BUSINESS ADMINISTRATION

PROFESSORS CAROTHERS, COWIN, AND DIAMOND,
ASSOCIATE PROFESSORS BRADFORD AND BISHOP,
ASSISTANT PROFESSORS BRATT, HARING, AND ALLEN,
MESSRS. PAYNE AND MAYER

Bus. 1. Industrial Evolution. An introductory course outlining the gradual development of economic organization, with

special attention to the stages of economic progress and social institutions growing out of these stages. First semester (3).

Bus. 2. Industrial Evolution. Continuation of Bus. 1, with special emphasis on the industrial revolution, the economic history of the United States, and modern industrial enterprises in America. Second semester (3).

Bus. 3. Economics. A general course in the principles of economics, covering the fundamental forces governing the production, distribution, and consumption of wealth, with emphasis on value, exchange, money, rent, interest, profits, and wages. Prerequisite: *sophomore standing.* First semester (3).

Bus. 4. Economics. Continuation of Bus. 3. Prerequisite: *sophomore standing;* Bus. 3. Second semester (3).

Bus. 11. Accounting. A study of the elementary principles of accounting, with sufficient practical work to develop a knowledge of accounting practice; theories of debit and credit; construction of accounts; partnership and corporation accounts; financial statements. First semester (3).

Bus. 12. Accounting. Continuation of Bus. 11. Prerequisite: *Bus. 11.* Second semester (3).

Bus. 15. Cost Accounting. A study of the methods used by manufacturing and commercial enterprises in ascertaining, recording, and controlling costs. Prerequisite: *Bus. 12 or 18.* First semester (3).

Bus. 16. Accounting Systems. A special study of various systems of accounts, with emphasis on cost accounting and production control. Prerequisite: *Bus. 12 or 18.* Second semester (3).

Bus. 18. Accounting for Engineers. An intensive course in the principles and practice of accounting, covering the fundamentals in one semester. Especially designed for engineering students. Prerequisite: *junior standing.* Second semester (3).

Bus. 21. Corporation Finance. An outline of the methods of corporations in obtaining capital, issuing securities, and extinguishing debts, with attention to the rights and obligations of security holders and to problems of corporation insolvency and dissolution. Prerequisite: *Bus. 4.* First semester (3).

Bus. 22. Corporation Finance. Continuation of Bus. 21. Prerequisites: *Bus. 4;* Bus. 21. Second semester (3).

Bus. 25. Corporation Finance. An intensive course covering the fundamentals of corporation finance in one semester. Especially designed for engineering students. Prerequisite: *Bus. 4.* First semester (3).

Bus. 29. Money and Banking. A study of the nature of money and the principles of banking, with emphasis on coinage systems, monetary standards, paper currency, the economic functions of banks, bank-note issue, various banking systems, and the Federal Reserve system. Prerequisite: *Bus. 4.* First semester (3).

Bus. 30. Money and Banking. Continuation of Bus. 29. Prerequisites: *Bus. 4;* Bus. 29. Second semester (3).

Bus. 33. Labor Problems. A course in the economics of labor, with special reference to the history of labor movements in the United States, forms of labor organizations, and the methods and policies of trades unions. Prerequisite: *Bus. 4.* First semester (3).

Bus. 34. Labor Problems. Continuation of Bus. 33, with emphasis on the problems of the employer, employers' associations, profit-sharing, welfare work, and social insurance. Prerequisites: *Bus. 4;* Bus. 33. Second semester (3).

Bus. 45. Statistics. A study of the methods of statistical description and induction, including tabular and graphic analysis and presentation. Prerequisite: *Bus. 4.* First semester (3).

Bus. 46. Business Cycles and Forecasting. A course dealing with the nature of the business cycle and the application of statistics to business trends, with special attention to forecasting and business barometers. Prerequisite: *Bus. 45.* Second semester (3).

Bus. 49. Economic Geography. A survey of the geographic factors determining economic development, with special reference to the chief economic materials and to the geographic influences responsible for the economic history and the economic

position of the United States. Prerequisite: *Bus. 4.* First semester (3).

Bus. 50. Economic Geography. Continuation of Bus. 49. Second semester (3).

Bus. 51. Social Institutions. A one-semester course outlining the fundamental institutions of the social order, with special reference to their origin, growth, and present interrelations. Prerequisite: Bus. 4. Not given in 1934-1935. First semester (3).

Bus. 56. Business Law. An intensive one-semester course in the essentials of business law. Prerequisite: *Bus. 4.* Second semester (3).

Bus. 57. Marketing. A course dealing with the distribution of economic goods, with emphasis on the chief agencies of distribution, marketing practice, and the produce exchanges. Prerequisite: *Bus. 4.* First semester (3).

Bus. 58. Advertising and Selling. Continuation of Bus. 57, dealing with the principles and the problems of advertising, sales management, and special methods of selling. Prerequisites: *Bus. 4;* Bus. 57. Second semester (3).

For Advanced Undergraduates and Graduates

Bus. 107. Advanced Economics. An advanced course in the principles of economics, dealing especially with the theory of the distribution of wealth, the nature of the productive process, the history of economic doctrines, and proposed plans of economic reform such as socialism. Prerequisite: *Bus. 4.* First semester (3). Professor Diamond.

Bus. 108. Advanced Economics. Continuation of Bus. 107. Prerequisite: *Bus. 4.* Second semester (3). Professor Diamond.

Bus. 113. Advanced Accounting. Advanced work in the field of accounting, with emphasis on the problems of assets valuation, corporation accounts, liquidations, and consolidations. Prerequisite: *Bus. 12 or 18.* First semester (3). Professor Cowin.

Bus. 114. Accounting Theory. A critical examination of the fundamental principles upon which accounting practice is

based, with a consideration of some special relationships between economics and accounting involved in problems of valuation, income and capital charges, and taxation. Prerequisite: *Bus. 12 or 18.* Second semester (3). Professor Cowin.

Bus. 123. Investments. A one-semester course which makes a detailed study, from the standpoint of the investor, of the various types of corporation and government securities, with special reference to owners' equities, comparative yields, and the machinery of investment, including stock exchange operations. Prerequisite: *Bus. 22 or 25.* First semester (3). Associate Professor Bishop.

Bus. 126. Public Finance. A one-semester course dealing with government expenditures and revenues, public debts and taxation, with emphasis on the economics and the administration of federal and state taxes. Prerequisite: *Bus. 4.* Secood semester (3). Associate Professor Bishop.

Bus. 131. Banking Policies. A course in American banking problems, with emphasis on Federal Reserve policy, operation problems of banks, and regulation. Prerequisite: *Bus. 30.* First semester (3). Associate Professor Bradford.

Bus. 132. Money Markets. Continuation of Bus. 131, dealing with the phenomena of money markets, American and European, including discount and credit conditions, foreign exchange, and international banking. Second semester (3). Prerequisite: *Bus. 30.* Associate Professor Bradford.

Bus. 135. Public Utilities. A course in the economics of transportation, with special reference to railways. Prerequisite: *Bus. 4.* First semester (3). Associate Professor Bishop.

Bus. 136. Public Utilities. Continuation of Bus. 135, with emphasis on the economics of the public utilities that supply electric light, gas, water, power, and communication services. Prerequisite: *Bus. 4.* Second semester (3). Associate Professor Bishop.

Bus. 161. Sociology. A study of the nature and the growth of social institutions, with emphasis on evolution, racial developments, social stratification, and the social problems connected with the institutions of private property, family organi-

zation, and sex. Prerequisite: *Bus. 4.* First semester (3). Professor Carothers.

Bus. 162. Sociology. Continuation of Bus. 161. Prerequisite: *Bus. 4.* Second semester (3). Professor Diamond.

CHEMISTRY AND CHEMICAL ENGINEERING

PROFESSORS ULLMAN, BABASINIAN, LONG, AND DIEFENDERFER, ASSOCIATE PROFESSORS EWING, ANDERSON, NEVILLE, AND THEIS, ASSISTANT PROFESSORS BECK, SIMMONS, BILLINGER, AND HAZLEHURST, MESSRS. SMULL, DE GRAY, AND KAUFFMANN

Chem. 1. Elementary Chemistry. Elementary phenomena and principles of chemistry. Lectures illustrated by experiments, diagrams, working drawings, and specimens from the museum. First and second semesters (2).

Chem. 3. Intermediate Chemistry. A course for students who pass the examination in elementary chemistry held during freshman week. Prerequisite: satisfactory preparation in the rudiments of chemistry. First semester (2).

Chem. 6. Advanced Chemistry. Inorganic chemistry. Lecture course with recitations. Theories of chemistry; physical and chemical methods of determining atomic and molecular weights, thermo-chemistry, dissociation, solution, catalysis, electrolysis, radio-activity, non-metallic elements and their compounds. Prerequisites: *Chem. 1 and 11, or 3 and 13; 20;* Chem. 8. First semester (3).

Chem. 7. Advanced Chemistry. Inorganic chemistry. Continuation of Chem. 6. Lecture course with recitations. Electronics, atom structure and phase rule, solid solutions, metallic elements and their compounds and alloys. Collateral reading. Prerequisite: Chem. 6. Second semester (3).

Chem. 8. Stoichiometry. Chemical problems and reactions. Prerequisites: Chem. 1 and 11 or 12, or 3 and 13. Second semester (1).

Chem. 11. Chemistry Laboratory. Experiments covering a systematic study of the chemical and physical properties of the

more important elements and their compounds. Deposit, $15.00. First and second semesters (2).

Chem. 12. Chemistry Laboratory. Primarily for Arts and Science and Business Administration students. An abridgment of Chem. 11. Deposit, $15.00. First semester (1).

Chem. 13. Chemistry Laboratory. Experiments designed to accompany Chem. 3. Prerequisite: satisfactory preparation in the rudiments of laboratory chemistry. Deposit, $15.00. First semester (2).

Chem. 14. Chemistry Laboratory. Primarily for Arts and Science and Business Administration students. An abridgment of Chem. 13. Deposit, $15.00. First semester (1).

Chem. 20. Qualitative Analysis. Metals and their industrially interesting compounds. The fundamental scientific principles and the practice of qualitative analysis methods. Accompanied by lectures and demonstrations. Deposit, $25.00. Prerequisites: Chem. 1 and 11 or 12, or 3 and 13. Second semester (3).

Chem. 21. Qualitative Analysis. Similar to Chem. 20 but shorter. Prerequisites: Chem. 1 and 11 or 12, or 3 and 13. Deposit, $25.00. Second semester (2).

Chem. 30. Quantitative Analysis. Practical work in the quantitative laboratory, accompanied by lectures and recitations; an introduction to gravimetric analytic method and typical fundamental volumetric processes. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21;* Chem. 8. Deposit, $30.00. First semester (3).

Chem. 31. Quantitative Analysis. Continuation of Chem. 30. Analysis of metallic products, ores, and alloys of industrial interest chosen to represent the application of quantitative chemical principles to analysis. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21;* Chem. 30. Deposit, $30.00. Second semester (3).

Chem. 33. Quantitative Analysis. Practical work in the quantitative laboratory. Analysis of simple chemical compounds, ores, and metallurgical products. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21;* Chem. 8. Deposit, $25.00. First semester (3).

Chem. 36. Quantitative Analysis. Practical work in the quantitative laboratory. Analysis of simple chemical compounds. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21;* Chem. 8. Deposit, $25.00. First semester (2).

Chem. 37. Quantitative Analysis. Continuation of Chem. 36. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21;* Chem. 8. Deposit, $30.00. Second semester (2).

Chem. 39. Assaying, Coal, Gas, and Oil Analysis. Lectures and laboratory practice in the furnace assay of the ores of lead, gold, and silver, and of gold and silver bullion; cyanidization; calculations for slags and slag mixtures; laboratory practice and class-room discussion of the analysis of boiler water, mine water, coal, coke, tar, gas, petroleum, and petroleum products; calorimetry. Prerequisites: *Chem. 8, and 30, 33, or 36.* Deposit, $30.00. Summer session: a lecture and seven hours of laboratory work each week-day for four weeks. Tuition fee, $40.00 (4).

Chem. 41. Quantitative Analysis Conference. Lectures and recitations concerning the scientific foundations and laboratory practice of Chem. 30. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21.* First semester (1).

Chem. 44. Quantitative Analysis Conference. Lectures and recitations pertaining to the laboratory work of Chem. 33. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21.* First semester (1).

Chem. 45. Quantitative Analysis Conference. Continuation of Chem. 41. Lectures and recitations to accompany Chem. 31. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21;* Chem. 41. Second semester (1).

Chem. 47. Quantitative Analysis Conference. Lectures and recitations to accompany Chem. 37. Second semester (1).

Chem. 48. Quantitative Analysis Conference. Lectures and recitations to accompany Chem. 36. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21.* First semester (1).

Chem. 49. Quantitative Analysis Conference. Lectures and recitations to accompany Chem. 37. Prerequisites: *Chem. 1 and 11, or 3 and 13, 20 or 21;* Chem. 48. Second semester (1).

Chem. 50. Summer Work. During the summer following the junior year students in the curriculum in Chemsitry are required to gather industrial experience by at least eight weeks' work in industrial shops or laboratories.

Chem. 78. Chemical Engineering. Principles of chemical engineering related to fluid flow and the transportation of solids, liquids, and gases; to machinery and materials of chemical plants; to crushing, grinding, and screening; to filtration, sedimentation, and general classification. In addition a thorough analysis of industrial processes is made through assigned reading in texts and current literature and through demonstration lectures. Prerequisites: *Math. 4, Chem. 6;* Math. 5, Chem. 30 and 41. First semester (3).

Chem. 98. Physical Chemistry. An abridgment of Chem. 190 and 191 for students in the curriculum in Metallurgical Engineering. Prerequisites: Math. 5, Chem. 6 and 33. Second semester (2).

Chem. 99. Research Chemistry Laboratory. Advanced stage of study or an investigation approved by the professor of Chemistry of some novel problem, involving exhaustive laboratory and library study. Deposit, $15.00. Second semester (2).

Deposits to cover breakage, chemicals, etc., are required as indicated above. The unused portion of the deposit is returned to the student.

For Advanced Undergraduates and Graduates

Chem. 134. Radiation Methods. The application of radiation methods, mainly X-ray methods, to chemical and industrial chemical problems. Prerequisite: senior standing. First semester (2). Associate Professor Anderson.

Chem. 135. Radiation Methods. Continuation of Chem. 134. Prerequisite: senior standing. Second semester (2). Associate Professor Anderson.

Chem. 138. Industrial Organic Analysis. A laboratory study of special operations in quantitative analytical chemistry as applied to organic compounds of industrial importance. The chemical analysis of drinking water and of milk is included in this course. Prerequisites: *Chem. 31 or 36, and 160.* Deposit,

$35.00. Second semester (2). Professor Diefenderfer, Professor Ullmann.

Chem. 144. Radiation Methods Laboratory. Laboratory practice in connection with Chem. 134. Prerequisite: senior standing. Deposit, $10.00. First semester (1). Associate Professor Anderson.

Chem. 145. Radiation Methods Laboratory. Continuation of Chem. 144. Prerequisite: senior standing. Deposit, $10.00. Second semester (1). Associate Professor Anderson.

Chem. 147. Industrial Analysis Conference. Conferences on the principles and the applications of the laboratory methods of industrial organic analysis of Chem. 138. Prerequisites: *Chem. 45 and 160.* Second semester (2). Professor Diefenderfer.

Chem. 160. Organic Chemistry. Lectures and recitations. A systematic survey of the typical compounds of carbon; their classification and general relations; study of synthetic reactions. Prerequisites: Chem. 20 or 21, and 30 or 33. First semester (4). Professor Babasinian, Mr. Smull.

Chem. 161. Organic Chemistry. Continuation of Chem. 160. Prerequisites: *Chem. 20 or 21, 30 or 33;* Chem. 160. Second semester (3). Professor Babasinian, Mr. Smull.

Chem. 162. Advanced Organic Chemistry. An advanced course in certain theories of organic chemistry. Prerequisites: *Chem. 160, 161, 165, and 166.* Given in alternate years. First semester (2). Professor Babasinian.

Chem. 163. Chemistry of Drugs, Dyes, and Related Compounds. Prerequisites: *Chem. 160, 161, 165, and 166.* Given in alternate years. First semester (2). Professor Babasinian.

Chem. 165. Organic Chemistry Laboratory. Determinations of specific gravities, melting points, boiling points, vapor densities; qualitative and quantitative determinations of carbon, hydrogen, nitrogen, and the halogens; preparation of pure organic compounds. Prerequisites: *Chem. 20 or 21;* Chem. 30 or 33. Deposit, $30.00. First semester (2). Professor Babasinian, Mr. Smull.

Chem. 166. Organic Chemistry Laboratory. Continuation of Chem. 165. Practical methods of saturation, nitration, reduction, diazotization, sulphonation, etc.; preparation of pure compounds; study of the properties of dyes and other commercial products. Prerequisites: *Chem. 20 or 21;* Chem. 30 or 33, and 165. Deposit, $40.00. Second semester (3). Professor Babasinian, Mr. Smull.

Chem. 167. Organic Chemistry Laboratory. Similar to Chem. 166 but shorter. Prerequisites: *Chem. 20 or 21;* Chem. 30 or 33, and 165. Deposit, $40.00. Second semester (2). Professor Babasinian, Mr. Smull.

Chem. 168. Industrial Biochemistry. The inorganic, organic, and physical chemistry of life processes and their products. Atomic and molecular structure, equilibria, colloidal state, catalysis, osmosis, synthesis, oxidation, and reduction as applying to carbohydrates, proteins, fats, lipoids, and their interrelations. Prerequisites: Chem. 160, 161, 165, and 166 or 167. This course may be taken without Chem. 169. First semester (2). Associate Professor Theis.

Chem. 169. Industrial Biochemistry Laboratory. Laboratory work to accompany Chem. 168. Prerequisites: Chem. 160 and 165. Deposit, $15.00. First semester (1). Associate Professor Theis.

Chem. 170. Industrial Biochemistry. Continuation of Chem. 168 with special adaptations to tanning, foods, fermentation industries, sanitation, and sewage-disposal. Second semester (3). Associate Professor Theis.

Chem. 179. History of Chemistry. Chronological development of the science, with assigned reading. Prerequisites: *Chem. 7 and 161.* Second semester (1). Professor Ullmann.

Chem. 180. Chemical Engineering Laboratory. Basic principles of chemical engineering applied to heat transfer, fuels and power, furnaces and kilns, gas producers, and combustion engineering; vaporization processes and evaporation; design and cost data on unit processes and manufacturing plants; laboratory work including study of precipitation, filtration, thickening and settling, classification, centrifuging, fluid transfer, heat transfer, pyrometry, drying, evaporation, distillation,

and absorption. Visits to industrial plants in the Philadelphia area for inspection of large units are an integral part of the course. Prerequisites: *Math. 5, Chem. 31, 45, 78, 160, 165;* Chem. 161, and 166 or 167. Deposit, $25.00. First semester (3). Assistant Professor Simmons.

Chem. 181. CHEMICAL ENGINEERING. Continuation of Chem. 180, including a study of humidity and psychrometry, humidifiers and coolers, drying, refrigeration, distillation, diffusional processes, absorption, extraction, crystallization, calculations of engineering design and assigned reading in chemical engineering economics and current literature. Visits to industrial plants in the New York area are a part of the course. Prerequisites: *Math. 5, Chem. 31, 54, 78, 160, 165;* Chem. 161, 166 or 167, 180, 190, 192. Second semester (3). Assistant Professor Simmons.

Chem. 185. CHEMICAL ENGINEERING PRACTICE. Comprehensive studies in nearby manufacturing plants of a few processes involving one or more unit engineering operations, these studies usually occupying time covering whole days or multiples thereof. Deposit, $10.00. Prerequisite: Chem. 180. Second semester (1). Assistant Professor Simmons, Associate Professor Theis.

Chem. 190. PHYSICAL CHEMISTRY. Lectures and recitations. Prerequisites: *Math. 5, Chem. 7, and 31 or 35, Phys. 6 and 7.* First semester (3). Associate Professor Ewing.

Chem. 191. PHYSICAL CHEMISTRY. Continuation of Chem. 190. Prerequisites: *Math. 5, Chem. 7, and 31 or 35;* Chem. 190. Second semester (2). Associate Professor Ewing.

Chem. 192. ELECTROCHEMISTRY. Chemical reactions in gases, solutions, and molten electrolytes caused by the electric current. Quantitative relations between electromotive force, electrical energy, and chemical energy. Efficiency and applicability of typical processes. Prerequisites: *Math. 5, Chem. 7, and 31 or 35, Phys. 6 and 7.* First semester (1). Associate Professor Ewing.

Chem. 195. PHYSICAL CHEMISTRY LABORATORY. Physical chemical measurements. Prerequisites: *Math. 5, Chem. 7, and 31 or 35.* Deposit, $10.00. First semester (1). Associate Professor Ewing.

Chem. 196. Physical Chemistry Laboratory. Continuation of Chem. 195. Prerequisites: *Math. 5, Chem. 7, and 31 or 35;* Chem. 195. Deposit, $10.00. Second semester (1). Associate Professor Ewing

Chem. 197. Electrochemistry Laboratory. Experimental study of electrochemical reactions; current efficiencies, electromotive force measurements and overvoltage; transport numbers; electrochemical preparations. Prerequisites: *Math. 5, Chem. 7, and 31 or 35.* Deposit, $5.00. First semester (1). Associate Professor Ewing.

For Graduates

The prerequisites for graduate work in chemistry as a major study are: Inorganic Chemistry (8), Qualitative Analysis (4), Quantitative Analysis (8), Organic Chemistry (10), Physical Chemistry (5), Physics (12), and Mathematics, including Calculus, (12). Students of exceptional ability may be able to make up minor deficiencies while carrying graduate work. If the deficiencies are serious, a student can hardly expect to complete the requirements for the master's degree within the minimum time.

Chem. 200. Inorganic Chemistry Research. Investigation in the field of inorganic chemistry and in drying oils and their metallic salts. Deposit, $30.00. First semester (4). Professor Long, Associate Professor Neville.

Chem. 201. Inorganic Chemistry Research. Continuation of Chem. 200. Deposit. $30.00. Second semester (4). Professor Long, Associate Professor Neville.

Chem. 202. Advanced Inorganic Chemistry. A course of conference and reading in the generalizations of inorganic chemistry. Prerequisite: a reading knowledge of German and French. First semester (2). Professor Long, Associate Professor Neville.

Chem. 203. Advanced Inorganic Chemistry. Continuation of Chem. 202. Second semester (2). Professor Long, Associate Professor Neville.

Chem. 230. Quantitative Analysis Research. Investigation of problems in analytic procedures. Deposit, $30.00. First semester (4). Professor Ullmann, Professor Diefenderfer.

Chem. 231. Quantitative Analysis Research. Continuation of Chem. 230. Deposit, $30.00. Second semester (4). Professor Ullmann, Professor Diefenderfer.

Chem. 236. X-ray Research. The investigation of chemical and industrial problems by X-ray diffraction methods. Deposit, $30.00. First semester (3). Associate Professor Anderson.

Chem. 237. X-ray Research. Continuation of Chem. 236. Deposit, $30.00. Second semester (3). Associate Professor Anderson.

Chem. 260. Organic Chemistry Research. Investigation of a problem in organic chemistry with particular reference to the dye industry. Deposit, $30.00. First semester (4). Professor Babasinian.

Chem. 261. Organic Chemistry Research. Continuation of Chem. 260. Deposit, $30.00. Second semester (4). Professor Babasinian.

Chem. 265. Advanced Organic Preparations. Mainly a laboratory course. Prerequisite: Chem. 165. Deposit, $30.00. First semester (2). Professor Babasinian.

Chem. 266. Advanced Organic Preparations. Continuation of Chem. 265. Deposit, $30.00. Second semester (2). Professor Babasinian.

Chem. 280. Industrial Chemistry and Chemical Engineering Research. Investigation of a problem in chemical engineering or in industrial chemistry. Prerequisites: for problems in industrial chemistry as in the statement above introductory to graduate courses; for investigation of a problem in chemical engineering, an undergraduate curriculum in chemical engineering substantially equivalent to the curriculum in this University. Deposit, $30.00. First semester (4). Professor Ullmann, Associate Professor Theis, Assistant Professor Simmons, Assistant Professor Billinger.

Chem. 281. Industrial Chemistry and Chemical Engineering Research. Continuation of Chem. 280. Deposit, $30.00. Second semester (4). Professor Ullmann, Associate Professor Theis, Assistant Professor Simmons, Assistant Professor Billinger.

Chem. 282. Chemical Engineering. Advanced consideration of chemical engineering energetics, hydrodynamics, and heat transfer applied to evaporation. distillation, crystallization, filtration, combustion, and refrigeration. A portion of these are carried in Chem. 283. Prerequisites: courses substantially equivalent to the undergraduate curriculum in chemical engineering in this University. First semester (3). Associate Professor Theis, Assistant Professor Simmons.

Chem. 283. Chemical Engineering. Continuation of Chem. 282. Second semester (3). Associate Professor Theis, Assistant Professor Simmons.

Chem. 288. Chemical Engineering Process Design. The applications of chemical engineering principles in the design of unit process equipment and the coordination of such units into organized production. Problems involving such processes as evaporation, distillation, drying, filtration, absorption, etc., are investigated in the laboratory, in the drafting room, and in operating plants. Prerequisites: courses substantially equivalent to the undergraduate curriculum in chemical engineering in this University. Deposit, $30.00. First semester (3). Associate Professor Theis, Assistant Professor Simmons.

Chem. 289. Chemical Engineering Process Design. Continuation of Chem. 288. Deposit, $30.00. Second semester (3). Associate Professor Theis, Assistant Professor Simmons.

Chem. 290. Physical Chemistry Research. Investigation of a problem in physical chemistry; vapor pressure and calorimetric studies in the constitution of inorganic salts. Prerequisites: the equivalent of Chem. 190, 191, 195, and 196. Deposit, $30.00. First semester (4). Associate Professor Ewing.

Chem. 291. Physical Chemistry Research. Continuation of Chem. 290. Deposit, $30.00. Second semester (4). Associate Professor Ewing.

Chem. 292. Theoretical Chemistry: Kinetics. Prerequisites: a good working knowledge of mathematics and the equivalent of Chem. 190, 191, 195, and 196. Given in alternate years. First semester (3). Assistant Professor Hazlehurst.

Chem. 293. Theoretical Chemistry: Kinetics. Continuation of Chem. 292. Second semester (3). Assistant Professor Hazlehurst.

Chem. 294. Theoretical Chemistry: Thermodynamics. Prerequisites: a good working knowledge of mathematics and the equivalent of Chem. 190, 191, 195, and 196. Given in alternate years. First semester (3). Assistant Professor Hazlehurst.

Chem. 295. Theoretical Chemistry: Thermodynamics. Continuation of Chem. 294. Second semester (3). Assistant Professor Hazlehurst.

Chem. 296. Colloids. Theories and applications of colloidal behavior. Lectures and seminar with occasional demonstrations. First semester (3). Associate Professor Neville.

Chem. 297. Catalysis. Theories of catalytic mechanism; preparation, activation, and control of catalysis; the applications of catalysis in various types of chemical reactions and in certain industrial processes; special topics in inorganic chemistry. Lectures, seminar, demonstrations. Second semester (3). Associate Professor Neville.

Chem. 298. Advanced Physical Chemistry. A course arranged to go forward from courses in elementary physical chemistry. Collateral reading required. Second semester (3). Associate Professor Ewing.

Chem. 299. Physical Chemistry Methods. Advanced course in methods of physical chemistry laboratory practice. Prerequisite: the equivalent of Chem. 195 and 196. Deposit, $30.00. First semester (2). Associate Professor Ewing.

CIVIL ENGINEERING

PROFESSORS SUTHERLAND AND WILSON,
ASSOCIATE PROFESSORS S. A. BECKER, FULLER, AND LYSE,
ASSISTANT PROFESSORS PAYROW, UHLER, AND JENSEN,
MR. KEYSER

C.E. 1. Engineering Drawing. The use of drawing instruments; lettering and tracing; mechanical drawing of objects; simple projections; isometric drawing; principles of descriptive geometry. First semester (2).

C.E. 2. Engineering Drawing. Continuation of C.E. 1. Working drawings; applications of descriptive geometry. Prerequisite: C.E. 1. Second semester (2).

C.E. 6. Land and Topographic Surveying. The theory and practice of land surveying, including computation of areas, dividing land, determining heights and distances; map drawing and topographic signs; field work with level and transit; map drawing from students' field notes; theory and use of stadia; detailed field work in rough country; pen topography and contour maps. A recitation and seven hours of field work each week-day for four weeks at summer camp. Tuition fee, $40.00. Prerequisites: *plane trigonometry;* C.E. 1. (4).

C.E. 7. Railroad Surveying. Reconnaissance, preliminary and location methods, with the theory of curves. A recitation and seven hours of field work each week-day for two weeks at summer camp immediately following C.E. 6. Tuition fee, $20.00. Prerequisite: C.E. 6. (2).

C.E. 8. Mechanics of Materials. The physical properties of structural materials; theory of beams, columns, and shafts, with the solution of many practical problems. Prerequisites: *Math. 4;* Math. 5. First semester (4).

C.E. 9. Mechanics of Materials. An abridgment of C.E. 8. Prerequisites: *Math. 4;* Math. 5. First semester (3).

C.E. 10. Materials Testing Laboratory. Fourteen experiments made by each student on wood, iron, and steel to determine the action of materials under stress and to study the physical properties of materials of construction. The work is done in the Fritz Engineering Laboratory. Requisite: *C.E. 8, 9, or 17, previously or concurrently.* Fee, $5.00. First semester (1).

C.E. 11. Railroads. Theory of curves and turnouts; preparation of profiles and maps; the computation of earth work and estimates of cost; the construction of road-bed, including ballast, cross ties, rails, switches, culverts, and other details. Prerequisite: C.E. 7. First semester (3).

C.E. 12. Hydraulics. Hydrostatics and theoretical hydraulics; the flow of water through orifices, weirs, tubes, pipes, and channels; naval hydromechanics; hydraulic motors; the solution of many practical problems. Prerequisites: *Math. 4;* Math. 5. Second semester (3).

C.E. 13. Hydraulics. An abridgment of C.E. 12. Prerequisites: *Math. 4;* Math. 5. First and second semesters (2).

C.E. 14. Hydraulics Laboratory. Fourteen experiments made by each student in the hydraulics section of the Fritz Engineering Laboratory, which is equipped with pumps, weirs, turbines, water-wheels, meters, and other apparatus for special work. Requisite: *C.E. 12 or 13, or Chem. 78, previously or concurrently.* Fee, $5.00. Second semester (1).

C.E. 15. Structural Theory: Stresses. Algebraic and graphic determination of stresses in roof and bridge trusses under dead, live, and wind loads; locomotive wheel loads on plate girders and bridge trusses. Prerequisite: C.E. 8 or 9. Second semester (4).

CE. 15a. Stresses. An abridgment of C.E. 15 for students in Sanitary Engineering. Prerequisite: C.E. 9. Second semester (3).

C.E. 16. Highway Engineering. The location, construction, and maintenance of roads and pavements; highway design. Prerequisite: C.E. 7. Second semester (3).

C.E. 16a. Highway Engineering. An abridgment of C.E. 16 for students in Sanitary Engineering. Prerequisite: C.E. 6. Second semester (2).

C.E. 17. Mechanics of Materials. A brief course somewhat more advanced in content than C.E. 8 or C.E. 9. Required in the curricula of Industrial Engineering and Mechanical Engineering. Prerequisites: *M.E. 4, Math. 4;* Math. 5. First and second semesters (2).

C.E. 20. Structural Theory. Analysis of stresses in beams and trusses; study of the principles of design of structural members. An elective course for mining engineers. Prerequisite: *C.E. 9.* First semester (2).

C.E. 25. Foundations. Construction and design. Prerequisites: *C.E. 8 or 9;* Geol. 9. Second semester (2).

C.E. 27. Contracts and Specifications. Lectures on the essentials of contracts and specifications for engineering structures. Prerequisite: junior standing. Second semester (3).

C.E. 29. Industrial Employment. During the summer following the junior year, students are required to spend at least eight weeks in shop work or on engineering construction, and are required to submit a written report.

C.E. 30. Structural Design. Design of mine structures in steel and wood. An elective course for mining engineers. Prerequisite: C.E. 20. Second semester (3).

C.E. 40. Engineering Conference. Required of seniors in the curriculum in Civil Engineering. Second semester.

C.E. 50. Thesis. Thesis may be taken only by students of outstanding ability. Second semester (3).

For Advanced Undergraduates and Graduates

C.E. 118. Structural Theory. Study of the principles of design of structural members of wood and steel. Concurrent with C.E. 119. Prerequisites: *C.E. 8;* C.E. 15. First semester (3). Professor Sutherland.

C.E. 119. Structural Design. Application of the principles studied in C.E. 118 to the design both of individual structural members and certain complete structures, principally a plate girder bridge, a steel building frame, and a truss bridge. Requisite: *Concurrent with C.E. 118.* First semester (3). Assistant Professor Uhler.

C.E. 122. Geodesy. Recitations, calculations, field work. Precise leveling; adjustment of instruments and investigation of their systematic errors; elements of least squares and their application to the adjustment of triangulations; field work in triangulation, in determination of azimuth, and with the plane table. Prerequisite: *C.E. 6.* Second semester (3). Professor Wilson.

C.E. 123. Railroads and Terminals. Maintenance of way and the elements of railroad operation. Lectures on the economics of railroad location; the arrangement of yards, stations, and terminals; train resistance; the application of electricity to the operation of railroads. Prerequisite: *C.E. 11.* Second semester (3). Professor Wilson.

C.E. 124. Structural Theory. Stress analysis with a brief introduction to the study of stresses in indeterminate struc-

tures. Prerequisite: *C.E. 15.* Second semester (3). Professor Sutherland.

C.E. 125. Reinforced Concrete Design. Theory of reinforced concrete; design of reinforced concrete buildings, bridges, and retaining walls. Prerequisites: *C.E. 8 or 9;* C.E. 15. First semester (3). Associate Professor Fuller.

C.E. 126. Concrete Laboratory. The manufacture, properties, and testing of cement, mortar, and concrete; tests on reinforced concrete beams and columns in the Fritz Engineering Laboratory. Requisite: *Concurrent with C.E. 125.* Fee, $5.00. First semester (1). Associate Professor Fuller.

C.E. 128. Sanitary Engineering. Systems of sewerage and methods of sewage treatment and disposal; the design of a sewerage system; house drainage. Prerequisite: C.E. 12 or 13, or Chem. 78. First semester (3). Assistant Professor Payrow.

C.E. 131. Advanced Sanitary Engineering. Continuation of C.E. 128. Second semester (3). Assistant Professor Payrow.

C.E. 132. Advanced Highway Engineering. Continuation of C.E. 16. Prerequisites: C.E. 8, 12, and 16. Second semester (3). Associate Professor Becker.

C.E. 133. Hydraulic and Water Power Engineering. Hydrology, stream flow and run-off, reservoirs, dams, flow in pipe lines and open channels, turbine characteristics, water power developments, water supply systems. Prerequisites: C.E. 12 or 13, or Chem. 78. Second semester (3). Assistant Professor Payrow.

C.E. 134. Hydraulic Engineering. The design of a water supply distribution system; study of the methods of treatment of public water supplies. Requisite: *concurrent with C.E. 133.* Second semester (1). Assistant Professor Payrow.

For Graduates

The following courses are open to engineering graduates only. The prerequisite for any course listed is the undergraduate course of similar title. Math. 217 and 218, Theory of Elasticity, may be included in a graduate major as though given in the department of Civil Engineering.

C.E. 201. ADVANCED STRUCTURAL THEORY. The design and investigation of statically indeterminate structures of steel and reinforced concrete, including arches. First semester (3). Professor Sutherland.

C.E. 202. ADVANCED STRUCTURAL THEORY. Continuation of C.E. 201. Second semester (3). Professor Sutherland.

C.E. 205. RAILROAD ENGINEERING. The economic location of railroads, as influenced by probable volume of traffic and cost of construction and operation; a study of the virtual profile in reducing gradients, with discussion of special cases. First semester (2). Professor Wilson.

C.E. 206 RAILROAD ENGINEERING. Continuation of C.E. 205. Second semester (2). Professor Wilson.

C.E. 207. SANITARY AND HYDRAULIC ENGINEERING. The designing of reservoirs, tanks, and pipe lines for water supply systems, and of sewers and other appurtenances for sewerage systems. Inspection of existing plants, with reports thereon. First semester (3). Assistant Professor Payrow.

C.E. 208. SANITARY AND HYDRAULIC ENGINEERING. Continuation of C.E. 207. Second semester (3). Assistant Professor Payrow.

C.E. 209. STRUCTURAL SEMINAR. Study of current discussion in the field of structural theory and design. First semester (3). Professor Sutherland.

C.E. 210. STRUCTURAL SEMINAR. Continuation of C.E. 209. Second semester (3). Professor Sutherland.

C.E. 211. REINFORCED CONCRETE. Results of research during the past thirty years on the principles of design of reinforced concrete members and structures. First semester (3). Associate Professor Lyse.

C.E. 212. RESEARCH METHODS. Study of principles of research as applied to engineering materials; measuring instruments, testing machines. First semester (3). Associate Professor Lyse.

C.E. 213. CONCRETE. Results of research during the past thirty years on the designing of concrete with reference to

quality (strength, permeability, shrinkage, etc.). Second semester (3). Associate Professor Lyse.

C.E. 215. Structural Materials. Laboratory and theoretical studies in the field of structural materials. First or second semester (3). Associate Professor Lyse.

ECONOMICS

See Business Administration

EDUCATION

PROFESSOR H. P. THOMAS, MR. LAFFERTY

Attention is also called to the statement concerning preparation for teaching, in the description of the College of Arts and Science.

Educ. 1. Introduction to Teaching. An orientation course required of all students who plan to enter the teaching profession. A general introduction to the field of education giving a broad survey of the work of the teacher and of the public schools. This course is required for the College Provisional Certificate. Should be taken during the junior year or earlier. First semester (3).

Educ. 20. Educational Psychology. An introductory course furnishing a psychological foundation immediately related to educational problems and practice. The major units are: the foundations of human motivation, learning, individual differences, psychology of school subjects, and growth and development. Practical problems involving analysis of designated material are assigned regularly for solution and report. This course is required for the College Provisional Certificate. Should be taken during the junior year. Prerequisite: *Psych. 1.* Second semester (3).

Educ. 51. Principles of High School Teaching. A study of basic methods of secondary instruction. The central aims are the organization of courses around criticized objectives and the conduct of classes along the lines of individualized instruction. Subsidiary problems and methods considered are: the objectives of education in relation to the curriculum; socialized

procedure; the problem-project method; the contract plan; types of teaching related to different fields; directed study. This course is recommended for the College Provisional Certificate. Should be taken during the senior year with Educ. 53. Prerequisites: *Educ. 1 and 20.* First semester (3).

Educ. 53. OBSERVATION OF SECONDARY SCHOOL TEACHING. Study, directed observation, and discussion of the various phases of teaching activity in high schools in or near Bethlehem. The class meets two hours each week. In addition, detailed reports are required for sixty observation periods. This course is required for the College Provisional Certificate. Prerequisites: *Educ. 1, 20, and 51.* Educ. 51 may be taken concurrently. First semester (3).

Educ. 54. PRACTICE TEACHING OF SECONDARY SCHOOL SUBJECTS. An intensive practical application of the principles of teaching to classroom conditions. The class meets two hours each week, in sections according to major interests, for the study of teaching procedure. actual organization, and planning of courses around definite objectives. In addition, sixty periods of acceptable supervised practice in the handling of classes and in the giving of instruction in high schools in or near Bethlehem are required. Students registering for this course must have at least one free hour at the same time each day throughout the week. Required for the College Provisional Certificate. Prerequisite: *Educ. 53 and fifteen semester hours in each subject the candidate expects to teach.* Second semester (3).

For courses in special methods, see Lat. 109 and 110, Ger. 21, P.E. 22, 23, and 24.

For Advanced Undergraduates and Graduates

Educ. 119. SOCIAL POLICY AND EDUCATION. A critique of the aims of education in the modern social order. The main points discussed are: the nature, needs, and adjustments of modern industrial society; the conflicting demands upon education by a changing civilization as represented by various modern social points of view; and the implications, for education, of contemporary American philosophy of democratic social progress. The discussion is made concrete in terms of practical conclu-

sions drawn for guidance of educational method and practice. Prerequisite: *consent of the instructor.* Not given in 1934-1935. First semester (3). Dr. Lafferty.

Educ. 120. THEORIES OF LEARNING AS REFLECTED IN EDUCATIONAL PRACTICE. An advanced study of human learning. particularly in relation to common teaching situations. Attention is given to: motivation, so far as it is related; types, conditions, and principles of learning with application to the direction and improvement of learning; individual differences in learning; and the effect of different methods of learning upon transfer of training. Emphasis is placed upon recent experimental literature. Prerequisites: *Educ. 1, 20, and 51, or their equivalent.* Not given in 1934-1935. Second semester (2). Dr. Lafferty.

Educ. 121. THE DIAGNOSIS AND ADJUSTMENT OF READING DIFFICULTIES. This course deals with the psychology of reading as related to learning difficulties. A study is made of the fundamental skills of reading, including eye movements, the measurement and diagnosis of reading difficulties, and recent experiments with remedial procedures. Practice is given in the development of material for remedial instruction. Prerequisite: *consent of the instructor.* Summer session (3). Dr. Lafferty.

Educ. 130. HISTORY OF EDUCATION IN EUROPE. The aim of this course is to understand modern education not only by showing how far it arises out of the thought and practices of the past, but by understanding how education has been related to the peculiar social and intellectual needs and conditions of its various periods. The course begins with a brief survey of the Greek, Roman, and early Christian periods; gives special attention to the late medieval and early modern periods; and closes with a summary of European movements since the Revolution. Prerequisite: *six hours in education.* Not given in 1934-1935. Second semester (3). Dr. Lafferty.

Educ. 131. HISTORY OF EDUCATION IN THE UNITED STATES. A study of the development of primary, secondary, and higher education in the United States. This course deals with the aims, curricula, methods, and systems of education, through five periods from Colonial times to the present, in relation to

the social conditions and processes. Prerequisite: *six hours in education.* Not given in 1935-1936. First semester (3). Professor Thomas.

Educ. 150. Principles of Secondary Education. A course dealing with the aims, organization, and materials of secondary education, characteristics of secondary school pupils, and a general treatment of the problems of secondary education. An introductory course to the field of secondary education. This course is recommended for the College Provisional Certificate. Prerequisite: *consent of the instructor.* Not given in 1935-1936. Second semester (3). Dr. Lafferty.

Educ. 151. Organization of Materials of Instruction. A practical course, designed primarily for the teacher in service, offering opportunity for cooperative planning of courses and units of instruction. Emphasis is laid on the selection, assembling, and organization of materials, applying the principles of curriculum construction. The teacher is expected to work in his or her field of special interest, correlating the material of that field with other fields. Prerequisite: *consent of the instructor.* Not given in 1935-1936. First semester (3). Dr. Lafferty.

Educ. 171. Elementary Educational Statistics. This course is designed to give teachers and high school principals the techniques necessary to enable them to gather data and present the results of work in their classrooms and schools. It aims to provide a practical knowledge of the simpler statistical methods for use in handling common problems and in understanding educational literature. Prerequisite: *consent of the instructor.* First semester (2). Professor Thomas, Dr. Lafferty.

For Graduates

The major in education on a graduate level is intended primarily for students preparing for high school administration and supervision. If any such student plans to combine administration and high school teaching he is expected to supplement his major with such further work in the field of his teaching as his advisor and the major professor in the field of teaching may recommend.

For students who want the master's degree for high school teaching, a major in education is not advised. The major should be taken in the field in which the student is teaching or preparing to teach, under the guidance of the major professor in that field. A minor in education for these students is recommended. This minor should include three hours in methods of teaching the student's special subject or Educ. 251.

Students interested in preparing for high school positions in guidance and counseling should consult with the head of the department.

At least four semester courses in education are prerequisite for a graduate major in this field. The prerequisites may be taken concurrently with a partial major program. Attention is called to Educ. 119, 120, 130, 131, 150, and 171, all of which are open to seniors and graduate students, and which may be accepted towards a major or a minor in education.

Educ. 221. Psychology of Secondary School Subjects. An analysis of the psychological development and behavior of secondary school pupils in connection with high school subjects. The course is developed around the main high school branches including also reading and arithmetic. In a subsidiary fashion attention is given to diagnostic work. Prerequisites: *Educ. 1, 20, and 51, or equivalent.* Not given in 1935-1936. First semester (2). Dr. Lafferty.

Educ. 222. Education of Exceptional Children. This course deals with the methods of instruction and the provision of materials for children who differ markedly from the normal. It is primarily concerned with the problem of the teacher of academic subjects in a system that does not afford special provision for the exceptional child. Part I deals with the sub-normal; Part II deals with gifted children. Prerequisite: *consent of the instructor.* Not given in 1935-1936. Second semester (3). Dr. Lafferty.

Educ. 251. Modern Trends in High School Teaching. This course is designed for the teacher in service and for principals who wish a knowledge of the most recent developments in the technique of teaching. Special attention is given to experimental studies in the field of method. Not given in 1934-1935. Pre-

requisite: *consent of the instructor.* First semester (2). Dr. Lafferty.

Educ. 253. Secondary School Administration. This course is concerned with the major problems of organization and administration of secondary schools. Topics to be considered include the program of studies, the teaching staff, pupil personnel, plant and equipment, and community relationships. This is one of the courses required for a principal's certificate. Prerequisite: *Educ. 150 or its equivalent.* Not given in 1934-1935. First semester (2). Professor Thomas.

Educ. 254. The Secondary School Curriculum. This course is related to Educ. 253, but is organized in such a way that it may be taken independently. Required for the principal's certificate. The purpose of this course is to acquaint students with the methods of study of curriculum problems, with the selection of subject matter in various fields, with the principles of program construction, and with similar problems. Prerequisite: *Educ. 150 or its equivalent.* Not given in 1935-1936. Second semester (2). Professor Thomas.

Educ. 256. Supervision in Secondary Schools. This course is related to Educ. 253 and 254. However, due to its organization, it may be taken independently. Another required course for the principal's certificate. The course deals with the purpose of supervision, a program for the improvement of teaching, the evaluation of teaching, measurement, supervisory relationships, and similar problems involved in the supervision of instruction in secondary schools. Prerequisite: *Educ. 150 or its equivalent.* Not given in 1935-1936. Second semester (2). Professor Thomas.

Educ. 274. Measurement in Secondary Education. The purpose of this course is to acquaint students with the selection of educational tests, the organization of a testing program, the use of tests in classification, the construction of classroom tests, the use of tests in improving high school teaching and diagnosis of pupil difficulties. For advanced work in this field attention is called to the seminar and individual research courses. Not given in 1935-1936. Second semester (3). Professor Thomas.

Educ. 280. Guidance in Secondary Schools. The general principles of guidance are the concern of this course. Major emphasis is upon educational and vocational guidance. Discovery of interests and abilities, study of occupations, study of educational opportunities, guidance activities, group programs, student personnel problems are topics for consideration in this course. Current practices are carefully examined. For advanced work in this field attention is called to the seminar and individual research courses. Not given in 1934-1935. Second semester (3). Professor Thomas.

Educ. 291-292. Seminars. One seminar is organized in each half year provided three or more students elect such work. These courses do not duplicate the courses of individual research. It is the purpose of seminar courses to provide for cooperative study of special problems in the field of secondary education. The following problems in particular are appropriate for this type of study:

Counseling in Secondary Schools.

The Administration of Extra-Curricular Activities.

Self Survey of a Secondary School through a Program of Measurement.

The Development of a Junior High School Organization in a Particular School System.

The Organization and Administration of a Guidance Program.

These problems are merely suggestive. Any similar problem in secondary school organization and administration may be used as a basis for a seminar course. Prerequisite: *consent of the instructor.* First and second semesters (2 or 3). Professor Thomas.

Educ. 293-294. Individual Instruction, Field Work, or Research. These courses are open to students with appropriate preparation and needs for pursuing independent investigation. The student must have shown interest and capacity for advanced work in the chosen field evidenced in part by an approved plan of work. Prerequisite: *consent of the instructor.* First and second semesters (2 or 3). Professor Thomas, Dr. Lafferty.

ELECTRICAL ENGINEERING

PROFESSORS SEYFERT AND BEAVER, ASSOCIATE PROFESSORS CREEDY AND HIBSHMAN, ASSISTANT PROFESSORS GRUBER AND A. R. MILLER, MESSRS. FORMHALS AND KNUTSON

E.E. 1. Principles of Electrical Engineering. Electric units and electric circuits; electric power and energy; resistance computations; electrolytic conduction; the magnetic circuit; the magnetic field. Prerequisites: *Phys. 1, Math. 2 and 20;* Phys. 6 and 7 concurrently. First semester (1).

E.E. 2. Direct-current Machinery. Study of induced and generated potentials; magnetic properties of iron and steel; force on a conductor; the construction, operation, and control of direct-current machinery; armature windings; characteristic curves. Illustrative problems. Prerequisites: *Math. 3;* E.E. 1. Second semester (3).

E.E. 3. Dynamo Laboratory, Elementary. Introductory course supplementing the class work of E.E. 2. Experimental studies and tests of direct-current generators, motors, and appliances, for characteristics, regulation, efficiency, insulation, etc. Prerequisites: *Math. 3;* E.E. 2 concurrently. Fee. $6.00. Second semester (1).

E.E. 4. Alternating Currents, Elementary. Alternating-current conceptions; study of circuit laws for series and parallel circuits containing R, L, and C; vector methods; complex quantities; single- and poly-phase circuits and measurement of power; alternating-current instruments. Lectures, recitations, and problem work. Prerequisites: *Math. 4, Phys. 6 and 7;* E.E. 2. First semester (3).

E.E. 5. Dynamo Laboratory, Intermediate, Direct Current. Continuation of E.E. 3. Advanced testing of direct-current machines. Alternating-current circuit experiments. Prerequisites: *Math. 4, Phys. 6 and 7;* E.E. 4 concurrently. Fee, $6.00. First semester (1).

E.E. 6. Alternating Currents, Advanced. Continuation of E.E. 4. Non-sinusoidal waves (Fourier analysis); mutual inductance; transformer; the induction motor; introduction to

synchronous machines. Lectures, recitations, and problem work. Prerequisites: *Math. 5;* E.E. 4. Second semester (3).

E.E. 8. Dynamo Laboratory, Intermediate, Alternating Current. Continuation of E.E. 5. Advanced testing of direct-current machines; alternating-current machinery testing begun. Lectures on methods of testing direct-current machinery and transformers. Prerequisites: *Math. 5;* E.E. 4. Fee, $6.00. Second semester (2).

E.E. 11. Dynamo Laboratory, Advanced. Advanced experimental studies and tests of direct- and alternating-current generators and motors, synchronous converters, transformers, and auxiliary apparatus. Lectures on methods of testing alternating-current machinery. Prerequisites: *E.E. 4 and 5;* E.E. 6 and 8. Fee, $12.00. First semester (3).

E.E. 15. Electrical Engineering Seminar. A weekly meeting for discussion of topics from the current journals of theoretical and applied electricity. Presentation of papers on assigned topics. Prerequisites: *E.E. 4;* E.E. 6. First semester (1).

E.E. 16. Electrical Engineering Seminar. Continuation of E.E. 15. Prerequisite: *E.E. 6.* Second semester (2).

E.E. 19. Dynamo Laboratory, Advanced. Continuation of E.E. 11. Advanced alternating-current machinery testing. Prerequisites: *E.E. 6 and 8;* E.E. 11 and 112. Fee, $12.00. Second semester (2).

E.E. 20. Electric Traction. The construction, equipment, and operation of different types of electric railways. The application of electric traction under steam railroad conditions; the dynamics of electric train movements; predeterminations of speed-time curves and the power required for different types of runs; choice of car equipment; cost of construction and of operation. Prerequisites: *E.E. 6;* E.E. 112 and 114. Second semester (3).

E.E. 23. Thesis for Degree of B.S. in Electrical Engineering. Each candidate for this degree may elect to present a thesis upon a subject chosen by the candidate during the first semester of the senior year. The work upon which the thesis is based may be done during either the first or second semester of the senior year and consists in part of reading from

references furnished by the professor in charge, and in part of independent work in theory, experimental research, or designing. Reports of progress on thesis work are required from time to time during the semester. Much importance is attached to the thesis as evidence of the candidate's ability to carry out an independent investigation. Prerequisite: senior standing. First or second semester (3).

E.E. 24. Summer Work. During the vacation following the junior year each student in electrical engineering is required to spend at least eight weeks in getting practical experience in some approved shop or plant. A written report on the shop or plant, and the experience gained therein, is due December 3. These reports should contain such calculations, photographs, drawings, and plots as each individual case may require.

E.E. 50. Dynamos and Motors, General. An abbreviated course adapted to those students who do not continue this subject in the following year; the principles and practice of direct-current engineering, including the elementary theory, construction, operation, and control of direct-current generators and motors, electromagnets, solenoids; illustrative problems. Prerequisites: *Math. 4, Phys. 6.* First and second semesters (2).

E.E. 51. Dynamo Laboratory, Beginning. Introductory course supplementing the class work of E.E. 50. Experimental studies and tests of direct-current generators and motors for characteristics, regulation, efficiency, etc. Requisite: E.E. 50 concurrently. Fee, $6.00. First and second semesters (1).

E.E. 52. Alternating Currents, General. A course following E.E. 50; the principles and practice of alternating-current engineering; the theory of alternating currents with applications to alternating-current generators, motors, transformers, and other apparatus; systems of transmission and distribution. Prerequisites: *Math. 4, Phys. 6;* E.E. 50. First and second semesters (2).

E.E. 53. Dynamo Laboratory, Intermediate. Continuation of E.E. 51, supplementing the class work of E.E. 52 and 54. Advanced testing of direct-current machines; practice in operating and testing alternating-current apparatus. Requisite: E.E. 52 concurrently. Fee, $6.00. First and second semesters (1).

E.E. 54. Electrical Engineering, Applications. A course particularly adapted to students who do not specialize further along electrical lines; systems of generation, transmission, distribution, and utilization taken up in order; under utilization special attention given to the application of electric motors to various industries; estimates and costs; problems. Prerequisites: *E.E. 50;* E.E. 52. Second semester (2).

E.E. 55. Dynamo Laboratory, Advanced. Continuation of E.E. 53, consisting of advanced direct- and alternating-current studies and tests. Primarily for non-electrical students taking more than the usual two semesters of dynamo laboratory. Prerequisites: *E.E. 50;* E.E. 53. Fee, $6.00. Second semester (1).

E.E. 56. Electrical Machinery. An abbreviated course covering the elementary principles of direct- and alternating-current machinery adapted to students requiring a minimum of electrical engineering, including: construction and operation of direct- and alternating-current generators and motors, transformers, converters, and related equipment. Prerequisites: *Math. 4, Phys. 6.* Second semester (2).

E.E. 57. Dynamo Laboratory, Combined. A brief course covering the simpler tests on direct- and alternating-current circuits and apparatus accompanying the class work of E.E. 56. Requisite: E.E. 56 concurrently. Fee, $6.00. Second semester (1).

For Advanced Undergraduates and Graduates

E.E. 112. Alternating-current Machinery. Study of the structural details, characteristics, and operation of alternators, alternating-current motors, synchronous converters, and transformers. Prerequisites: *Math. 6;* E.E. 6. First semester (3). Professor Beaver.

E.E. 113. Electrical Design. Application of electric, magnetic, and mechanical principles to the design of direct-current generators and transformers; predetermination of characteristics and performance; armature winding. Lectures, recitations, poblems, drafting. Prerequisites: *E.E. 2 and 4.* First semester (3). Professor Beaver.

E.E. 114. Electric Stations. Consideration of prime movers; generating machinery, discussion of types and operation; auxiliary machinery and transformers; storage batteries and their application; switch-boards, measuring and protective devices; design and arrangement; station characteristics; sub-stations; operation and management; methods and principles of rate making; visits to neighboring plants. Prerequisites: *Math. 6, M.E. 23;* E.E. 6 or 52, C.E. 13. First semester (3). Professor Seyfert.

E.E. 117. Electrical Design. Continuation of E.E. 113. Application of electric, magnetic, and mechanical principles to the design of alternators and induction motors; predetermination of characteristics and performance; rotor and stator windings. Lectures, recitations, problems, and drafting. Prerequisites: *E.E. 6;* E.E. 112. Second semester (3). Professor Beaver.

E.E. 118. Electric Power Transmission. The long distance transmission of power by electricity; mathematical determination of line constants, regulation, efficiency, power limits, interference, transients, etc.; switching and protection of circuits. Prerequisites: *Math. 6, E.E. 6;* E.E. 114. Second semester (3). Professor Seyfert.

E.E. 121. Electrical Communication, I. The principles of wire and radio communication. Class work includes a physical and mathematical analysis of the fundamental telephone and telegraph circuits and constants, the propagation of electric waves along wires and cables, transmission problems and practice, carrier current communication, and the elements of radio communication. Laboratory work consists of experimental checks upon the theory developed in the class room. Prerequisite: *E.E. 4 or 52;* Math. 6. Fee, $6.00. First semester (3). Mr. Knutson.

E.E. 122. Electric Transients. A recitation, lecture, and laboratory course in elementary electric transients, designed to give a physical and quantitative idea of the more common transients occurring in electrical circuits, apparatus, and transmission lines; oscillograms of transients obtained in the laboratory to substantiate the theory of the classroom. Prerequi-

sites: *Math 6, E.E. 6;* E.E. 112. Fee, $6.00. Second semester (3). Assistant Professor Miller.

E.E. 126. Electrical Communication, II. A survey of the methods of electrical communication, principles of various systems of wire telegraphy, wire telephony, radio telegraphy and telephony, and laboratory measurements on radio and other communication circuits. Prerequisite: *Math. 6;* E.E. 121. Fee, $6.00. Second semester (3). Mr. Knutson.

E.E. 127. Dielectric Phenomena. A study of the fundamental principles of electrostatic and magnetic fields, laws of corona, etc., and their applications in the field of electrical engineering. Prerequisites: *E.E. 6, Math. 6.* Second semester (3). Assistant Professor Miller.

For Graduates

For graduate students intending to take their major subjects in electrical engineering a preparation equivalent to the work required for the B.S. in E.E. degree is necessary. Math. 225, Operational Calculus, may be included as a graduate major in electrical engineering.

Graduate courses are given to qualified men from the industries of the surrounding district. To suit the convenience of these men the work is carried on in evening sessions.

E.E. 203. Electrical Design. A course consisting of predeterminations by calculation of the characteristics, regulation, and performance of electrical machinery. Analysis and use of design constants. Design of special machines. First semester (3). Professor Beaver.

E.E. 204. Electrical Design. Continuation of E.E. 203. Second semester (3). Professor Beaver.

E.E. 207. Electrical Testing. Special experimental research in electrical engineering: regulation of alternators, rectifiers, harmonic synthesis and analysis, transmission line behavior, or special problems of interest to the student. Fee, $12.00. First semester (3). Professor Seyfert, Associate Professor Hibshman.

E.E. 208. Electrical Testing. Continuation of E.E. 207. Fee, $12.00. Second semester (3). Professor Seyfert, Associate Professor Hibshman.

E.E. 209. Radio Communication. The theory underlying the various sending and receiving systems, and the propagation of electromagnetic waves, combined with experimental work in connection with the department's wireless equipment. First semester (3). Mr. Knutson.

E.E. 210. Radio Communication. Continuation of E.E. 209. Second semester (3). Mr. Knutson.

E.E. 211. Electric Transients. The theory of transients in the more complicated types of electrical circuits, electrical apparatus, and transmission lines, as applied in electrical engineering; oscillograms of all transient phenomena discussed taken in the laboratory. Two lectures and one laboratory period a week. Fee, $6.00. First semester (3). Assistant Professor Miller.

E.E. 212. Electrical Transients. Continuation of E.E. 211. Treatment of circuits and transients by operational calculus methods. Second semester (3). Assistant Professor Miller.

E.E. 213. Advanced Theory of Power Transmission. A course covering methods of determining the exact solution of transmission line problems; study of line transients and short circuits; problems on power limits and stability of systems. First semester (3). Professor Seyfert, Assistant Professor Miller.

E.E. 214. Advanced Theory of Power Transmission. Continuation of E.E. 213. Second semester (3). Professor Seyfert, Assistant Professor Miller.

E.E. 215. Vacuum Tubes and Their Applications. A mathematical and physical consideration of electronic discharges in vacuum and in gases. The applications of these principles to the diode, triode, tetrode, pentode, photoelectric cells, etc. A detailed study of the static and dynamic characteristics of these tubes. The use of vacuum tubes in radio, television, rectification, and miscellaneous industrial fields. First semester (3). Mr. Knutson.

E.E. 216. Vacuum Tubes and Their Applications. Continuation of E.E. 215. Second semester (3). Mr. Knutson.

E.E. 217. The Economics of Electric Power. A treatment of economic principles as applied to the design, selection, and use of electrical apparatus, plants, and systems; the adjustment of fixed charges and operating expenses by the application of Kelvin's law to problems of generation, transmission, conversion, distribution, and utilization of electric power. First semester (3). Professor Beaver.

E.E. 218. The Economics of Electric Power. Continuation of E.E.217. Second semester (3). Professor Beaver.

ENGLISH

PROFESSORS SMITH AND LUCH, ASSOCIATE PROFESSOR RILEY, ASSISTANT PROFESSORS GRAMLEY AND SEVERS, MESSRS. SLOANE, DEPTULA, GALE, PHY, RIGHTS, KOST, EHRSAM, AND HARDING

Engl. 0-1-2-3a-3b. Freshman Composition and Literature. The freshmen are distributed, upon the basis of preliminary tests given during freshman week, into three groups: low, English 0; middle, English 1; high, English 3a. The low group receives drill in grammar and in the mechanics of composition; the middle group studies exposition; the high group reads widely in literature as a basis for critical writing.

Engl. 1 and 2 constitute the minimum freshman requirement. Since no college credit is given for Engl. 0, students in the low group are required to take Engl. 2 either in summer session or during the second year, in order to complete the six required hours. A student whose work shows that he has been placed in the wrong group may be transferred to the higher or to the lower group at any time during the year, if his instructor recommends and the head of the department approves the transfer. First and second semesters (3).

Engl. 3a. Types of World Literature. A study of the masterpieces of world literature. Required of freshmen in the high group, and recommended for students, especially sophomores, who are taking a major in literature. First semester (3).

Engl. 3b. Types of World Literature. Continuation of Engl. 3a. Second semester (3).

ENGLISH LITERATURE AND COMPOSITION

Students wishing a major in English literature should take as preliminary work either Engl. 3a, 3b, or 4, 5, or such equivalent courses as may be recommended by the head of the department. They should then elect two English courses in the junior year and at least two in the senior year. Students working for honors take a seminar course in which they prepare a thesis as part of the honors requirement.

Engl. 4. A Study of the Drama. Reading and critical study of types of the drama; theories of the drama; the drama and the stage; the drama as a criticism of life. Required of English majors. First semester (3).

Engl. 5. A Study of the Drama. Continuation of Engl. 4. Second semester (3).

Engl. 6. The Modern Essay. An advanced composition course in writing essays and narrative types with a study of leading modern essayists. Prerequisites: Engl. 1 and 2. First semester (3).

Engl. 7. The Short Story. A critical study of the short story, English, American, and continental. Class discussions, extensive collateral reading, and reports. Prerequisites: Engl. 1 and 2. Second semester (3).

Engl. 18. The Novel. A study of types of the novel. Reading and reports. Lectures on the history of the novel in England and America. Not given in 1934-1935. First semester (3).

Engl. 19. The Novel. Continuation of Engl. 18. Not given in 1934-1935. Second semester (3).

Engl. 20. American Literature, 1607-1855. Lectures, textbook, and supplementary reading. First semester (3).

Engl. 21. American Literature, 1855 to the Present. Continuation of Engl. 20. Second semester (3).

Engl. 41. Business Correspondence. The basic principles of letter writing for the business man and engineer. Practice in writing letters of inquiry, application letters, sales letters, adjustment letters, credit letters, letters of reply, and collec-

tion letters. Prerequisites: Engl. 1 and 2. First and second semesters (3).

Engl. 42. Writing for Business. Study and practice of all types of reports which the engineer or business man must write, from the short letter report to the long technical report. A part of the semester is devoted to the writing of semi-popular articles on technical or practical subjects. Prerequisites: Engl. 1 and 2. First and second semesters (3).

Engl. 61. Dramatics. A course in the practical technique and the production of plays; acting, stage-lighting, costume selection and design, scenic design and execution, and student direction of plays. Each member must write either an original one-act play or a thesis upon any practical problem of the modern theatre. The aim of the course is to present at least one original play each semester. Prerequisite: sophomore standing. First semester (3).

Engl. 62. Dramatics. Continuation of Engl. 61. Second semester (3).

For Advanced Undergraduates and Graduates

The courses in this group are open to students of junior standing.

Engl. 100. Greek Literature in English Translation. Required reading of the Greek literary masterpieces in the best English translations available. Special attention is given to the following types of literature: epic, drama, literary criticism, and lyric poetry. Students are expected to read the whole of the *Iliad* and the *Odyssey*, and the principal tragedies and comedies not already studied in other courses. First semester (3). Professor Smith, Professor Luch, Associate Professor Riley.

Engl. 115. The Bible as Literature. An outline study of the history of the origin and of the transmission of the books that make up the Bible; a survey of the chief translations, especially in as far as they are of literary importance; a more detailed study of the types of literature found in the Bible; and an estimate of the influence of the Bible upon world liter-

ature, with special reference to English literature. First semester (3). Professor Luch.

Engl. 116. The Bible as Literature. Continuation of Engl. 115. Second semester (3). Professor Luch.

Engl. 117. Contemporary Drama. A study of types of the drama. Summer session (3). Professor Luch.

Eng. 120. The Nineteenth Century Novel. A study of the development of prose fiction in the nineteenth century. Summer session (3). Associate Professor Riley.

Engl. 121. Contemporary Literature. A study of present-day American writers exclusive of the drama. Collateral readings and reports. Book fee, $2.50. First semester (3). Professor Luch.

Engl. 122. Contemporary Literature. A study of present-day English and European writers exclusive of the drama. Collateral readings and reports. Book fee, $2.50. Second semester (3). Professor Luch.

Engl. 123. Shakespeare and the Elizabethan Drama. A study of the development of the English drama to 1642, including the important plays of Shakespeare. First semester (3). Professor Smith.

Engl. 124. Shakespeare and the Elizabethan Drama. Continuation of Engl. 123. Second semester (3). Professor Smith.

Engl. 125. English Literature of the Romantic Era. Not given in 1934-1935. First semester (3). Professor Smith, Assistant Professor Severs.

Engl. 126. English Literature of the Victorian Age. Not given in 1934-1935. Second semester (3). Professor Smith, Assistant Professor Severs.

Engl. 131. Milton and the Seventeenth Century. A survey of the life and literature of the seventeenth century with special study of Milton. First semester (3). Associate Professor Riley.

Engl. 132. Eighteenth Century Literature. A study of the writings of Pope, Swift, and other Augustans, followed by a study of Dr. Johnson and his circle. Second semester (3). Mr. Sloane.

For Graduates

Students desiring to major in English literature should have had at least twelve semester hours in connection with their undergraduate work that bear upon this field of study or in other ways should satisfy the department that they are in a position to undertake profitably the required program for the master's degree. Students should register for graduate work only after consultation with the head of the department.

Engl. 220. Graduate Seminar. An intensive study of the works of an English author. Summer session (3). Professor Smith.

Engl. 221. Graduate Seminar. Research and reports. First semester (3). Professor Smith.

Engl. 222. Graduate Seminar. Continuation of Engl. 221. Second semester (3). Professor Smith.

Engl. 227. Anglo-Saxon. A study of the Anglo-Saxon language and literature. Lectures and supplementary reading in the history of the English language and its relation to other Indo-European languages. First semester (3). Associate Professor Riley.

Engl. 228. Chaucer. A study of the life and principal works of Chaucer, with some attention to his chief contemporaries. Lectures, readings, class discussions, and reports. Second semester (3). Associate Professor Riley.

Engl. 229. Literary Criticism. A course aimed to correlate and unify the student's previous work in literature by means of wide reading in critical literature and discussions of theories and schools of criticism. First semester (3). Professor Smith.

Engl. 230. Literary Criticism. Continuation of Engl. 229. Second semester (3). Professor Smith.

Engl. 231. Graduate Theses. First semester (3). Professor Smith.

Engl. 232. Graduate Theses. Second semester (3). Professor Smith.

PUBLIC SPEAKING

Engl. 10. Public Speaking. A foundation course in the various types of public address. Particular stress is laid in this course upon ability to think in spoken discourse and to attain ease and proficiency in the use of body and voice. First semester (3).

Engl. 11. Public Speaking. A course giving training beyond that of Engl. 10. Analysis of the psychological aspects of the speech situation; study of models; delivery of speeches prepared for audiences of various kinds. Second semester (3).

JOURNALISM

Students majoring in journalism take Engl. 43, 44, 46, 50, 51, and 54. They must also complete four semesters of Engl. 71-78. Other requirements include twelve hours to be chosen from the following courses: Engl. 4, 5, 6, 7, 123, and 124 or such equivalents as may be allowed; and also Hist. 25 and 26, Govt. 51 and 52, Psych. 1 and 4, Bus. 3, 4, 161, and 162. During the junior or senior year a field trip to New York is taken to visit metropolitan newspaper plants, and the headquarters of press associations, feature syndicates, photo services, etc. The comprehensive examination in journalism includes the content of courses studied in the sophomore, junior, and senior years.

Engl. 43. Newspaper Reporting and Writing. A beginning course in newspaper journalism. Definition of news; news values and reader interest; structure of the news story; newspaper English; how to report and write simple news stories. Copy is handled by the instructor as it would be in a newspaper editorial room. Prerequisites: Engl. 1 and 2. Fee, $2.00. First semester (3).

Engl. 44. Advanced Newspaper Reporting and Writing. Continuation of Engl. 43. A course in the reporting and writing of particular types of news. Special attention is paid to news of public affairs: criminal and civil courts, bankruptcy proceedings, the Federal building, city hall, school board, police station, the county offices, politics, business and labor, etc. Fee, $2.00. Second semester (3).

Engl. 45. Feature and Magazine Writing. Writing all kinds of feature articles from newspaper "brighteners" to essays of

opinion, personality sketches, etc., of magazine length. A different current magazine is studied each week as a model. Prerequisites: Engl. 1 and 2. Fee, $1.50. First semester (3).

Engl. 46. Newspaper Editing and Copy Reading. Study and practice of the technique of the newspaper copy reader and news editor; headline writing and make-up. Prerequisites: Engl. 43 and 44. Fee, $1.50. First semester (3).

Engl. 50. Editorial Writing and Modern Problems. The content and technique of the editorial. Discussion of modern problems and review of individual prejudices as preliminary to writing of editorials on contemporary events. A study of the editorial pages and policies of leading American newspapers. Prerequisite: junior standing. First semester (3).

Engl. 51. Newspaper Problems and Policies. A study of the ethical principles of newspaper publishing: "To print or not to print"; sensational or "yellow" journalism; tabloids; faking; ghost writing; crusades. Study of the law of libel and of postal regulations governing newspapers; review of rights of fair comment and criticism as they relate to books, drama, and other public offerings. Prerequisite: junior standing. Second semester (3).

Engl. 53. History of American Journalism. English background of American newspaper; development of press from colonial days to the present; influence of newspaper on American life; contributions of outstanding journalists from Benjamin Franklin and Peter Zenger to Joseph Pulitzer and William Randolph Hearst. Prerequisite: junior standing. Not given in 1934-1935. Second semester (3).

Engl. 54. Journalism Seminar. Required of students of senior standing who are majoring in journalism. Survey of the newspaper field in its relation to public affairs; review of recent American history as background for study of current events. Extensive reading in books, magazines, and newspapers. Seccnd semester (3).

Engl. 71-78. Brown and White. Enrollment constitutes membership on the staff of the semi-weekly paper. All composition work is for publication. Students enrolling for their first sem-

ester sign for Engl. 71; for their second semester, Engl. 72; etc. By faculty action this course may be elected each semester for credit in addition to other courses on a student's roster. Students also enroll in Engl. 71-78 for the business staff of the paper. Fee, $1.00. First and second semesters (1).

FINE ARTS

ASSOCIATE PROFESSOR HOWLAND

F.A. 1. History and Appreciation of the Fine Arts. Presentation of elementary principles that enable the beginner to attain some knowledge and enjoyment of the fine arts; the historical development of art traced through the ancient and mediæval periods. Lectures. First semester (3).

F.A. 2. History and Appreciation of the Fine Arts. Continuation of F.A. 1. The art of the Renaissance and present day. Second semester (3).

F.A. 3. History of Architecture. Lectures covering the development of architecture from its beginnings in Egypt and Mesopotamia, through Greece and Rome and the Early Christian period to Romanesque, touching upon the building of the Orient. First semester (3).

F.A. 4. History of Architecture. Continuation of F.A. 3. The development of Gothic architecture, the Renaissance, and successive movements down to and including the present day. Second semester (3).

F.A. 5. Freehand Drawing. Elementary freehand perspective, followed by drawing from still life objects in pencil, charcoal, and in the various modes: delineation, form-drawing, color-value. First semester (3).

F.A. 6. Freehand Drawing. Further practice in expression; color theory with simple exercises in water color. Second semester (3).

F.A. 17. Criticism and Analysis of Art. An advanced course primarily for majors. Readings, investigations, reports, conferences in regard to the works of writers on art with special reference to painting, particularly from the following men: Aristotle, Leonardo da Vinci, Winckelmann, Joshua Rey-

nolds, Tolstoi, Lessing, Taine, Goethe, Ruskin, Whistler, Cox, Baldwin Brown, Cortissoz, John LaFarge, Clive Bell, Berenson, Barnes, Roger Fry. The attempt is made to formulate the theories of art upon which the criticisms are based as well as a study of the paintings themselves in the light of these comments. There is also an effort to distinguish the differing aims of the chief schools of art, with a chronological study of the changes which have taken place in the attitude both of artist and of the public. This is followed as time and the aptitude of the students permit by an analytical study of paintings from the compositional and interpretive points of view. Prerequisite: F.A. 1 and 2 or the ability to satisfy the instructor of one's suitable preparation in the history of fine arts. Prospective students should consult the instructor before enrolling. First semester (3).

F.A. 18. Criticism and Analysis of Art. Continuation of F.A. 17. Second semester (3).

FRENCH

See Romance Languages

GEOLOGY

PROFESSOR R. L. MILLER, ASSOCIATE PROFESSOR FRETZ, MESSRS. WHITCOMB AND FRASER

Geol. 1. Mineralogy. The principles of crystallography with practice in determination of forms of models and crystals; the physical properties, origin, occurrence, association, and alteration of minerals; a study of about two hundred of the common mineral species and varieties, with practice in identification based on physical and chemical properties, including blowpipe exercises. Student should have had Chem. 1 and 11, or 3 and 13. Fee, $5.00. First semester (4).

Geol. 1a. Mineralogy. Similar to Geol. 1, but without blowpipe exercises. Fee, $5.00. First semester (3).

Geol. 2. Blowpipe Analysis. A course in qualitative blowpipe analysis in which the chemical and physical behavior of the common chemical elements and their compounds is noted;

methods of rapid qualitative tests for the identification of minerals and chemical compounds with the aid of the blowpipe. Student should have had Chem. 1 and 11, or 3 and 13, and 20. Fee, $2.00. First semester (1).

Geol. 3. Introduction to Geology. A study of geologic processes designed to furnish an introductory survey of the subject of geology. Includes a brief survey of historical geology. Text-book and lectures. Concurrent with Geol. 6. First semester (2).

Geol. 4. General Geology. A course in dynamic and structural geology. Text-book, supplemented by illustrated lectures in which the relation of geology to economic problems is discussed. Second semester (2).

Geol. 5. Petrology. Macroscopic study of igneous, sedimentary, and metamorphic rocks; their origin, classification, and identification. Concurrent with Geol. 4. Prerequisite: Geol. 1 or 1a. Second semester (1).

Geol. 6. Geology Laboratory and Field Trips. The region affords excellent examples of varied structures and contains numerous quarries and mines where slate, cement rock, limestone, sandstone, gneiss, serpentine, iron, and zinc are or were once obtained, and gravel, sand, and clay pits. These and other geologic features are observed in the field trips. Indoor laboratory work consists of study of geological specimens and maps. Concurrent with Geol. 3 and 4. Fee, $1.00. First and second semesters (1).

Geol. 7. Non-Metallic Economic Geology. A study of the origin, modes of occurrence, properties, sources, production, and uses of non-metallic mineral products. Prerequisites: Geol. 3 or 4, 5, and 6, or 16 and 17. First semester (2).

Geol. 8. Historical Geology. A study of the development of the continents and life forms. A discussion of evolution based on the remains of animal and plant life preserved in the rocks. Text-book, lectures, and laboratory exercises. Prerequisite: Geol. 3 or 4, or 16 and 17. First semester (3).

Geol. 9. Engineering Geology. Designed primarily for engineering students. Includes a study of selected minerals,

rocks, building stones, and road materials. Applications of geology to the construction of dams, tunnels, building foundations, and highways, and to the problems of underground water conditions, flood control, etc. Two lectures and one laboratory. Prerequisites: Geol. 3 or 4, and 6. Second semester (3).

Geol. 16. Physiography. A study of the origin, history, and economic significance of topographic features, soils, and natural resources; occasional field trips and laboratory work devoted to instruction and practice in the interpretation and construction of topographic maps. First semester (3).

Geol. 17. Physiography, Continued. Meteorology, climatology, oceanography, and geographical location are considered separately. This is followed by a consideration of these and other factors constituting the natural environment, in their effect upon man. Laboratory and field exercises. Prerequisites: Geol. 3, 4, or 16, and 6. Second semester (3).

Geol. 18. Meteorology and Climatology. A study of the atmosphere and its work followed by investigations of climate. One laboratory period each week is devoted to meteorological instruments, preparation and interpretation of weather maps and other meteorological data, and making forecasts. Second semester (3).

For Advanced Undergraduates and Graduates

Geol. 108. Metallic Economic Geology. A study of the geological occurrence, distribution, uses, and commercial production of the metalliferous minerals; consideration of the most important mining districts. Recitations, illustrated lectures, field trips, and laboratory examination of ore specimens from representative districts of North and South America and other countries; visits to the zinc mines of Frankiin Furnace, N.J., and Friedensville, Pa., the magnetite mines of Dover, N.J., and Cornwall, Pa., and the anthracite coal regions. Prerequisites: Geol. 1, 3 or 4, and 6. Second semester (3). Dr. Fraser.

Geol. 109. Paleontology. The plant and animal fossils are studied mainly from the morphologic point of view; evolution of the faunas and floras. Lectures and laboratory work. Pre-

requisite: Geol. 3 or 4, or 16 and 17; or Biol. 1, or 7 and 8. Second semester (3). Dr. Whitcomb.

Geol. 110. Stratigraphy. The principles of correlation of the sedimentary rocks based upon the conditions of sedimentation and the use of index fossils. Study in the laboratory of characteristic faunas, the geologic age, and geographic distribution and structural features of the rocks of North America. In the spring, field trips illustrating the use of sedimentary structures and faunas in the delimitation of periods and formations, and in the solution of other stratigraphic problems. Prerequisite: Geol. 8 or 109. Second semester (2). Dr. Whitcomb.

Geol. 111. Field Geology. Practice in the actual mapping of surface geology, each student being assigned a definite area and required to prepare a report on the assigned area accompanied by a geological map with structure sections; collection by each student of a full set of specimens to illustrate the geology. The first part of the course devoted exclusively to field work; the notes and specimens studied in the laboratory when the weather prevents further outdoor work. Prerequisites: Geol. 3 or 4, 5, and 6. Fee, $1.00. First semester (2). Professor Miller.

Geol. 112. Petrography. The optical properties of minerals and their study with the petrographic microscope; petrography of the most important igneous rocks. Lectures, recitations, and laboratory work. Prerequisites: Geol. 1 and 5. Fee, $3.00. First semester (2). Dr. Fraser.

Geol. 113. Petroleum Geology. Properties of petroleum and natural gas, origin, occurrence, methods employed by geologists in locating favorable localities, characteristics of domestic and foreign oil and gas fields, economics of oil industry. Prerequisite: six hours of geology. Second semester (3). Professor Miller, Dr. Fraser.

Geol. 114. Structural Geology. The study of special features of structural geology in the field and laboratory. Prerequisites: Geol. 3 or 4, and 6. First semester (2). Dr. Fraser.

Geol. 115. Geologic Methods. Methods used by the United States Geological Survey and by the mining companies that

employ geologists; special attention to the problems that confront an economic geologist in the investigation of coal lands, oil properties, metal mines, etc. Prerequisite: Geol. 111. Second semester (2). Dr. Fraser.

Geol. 116. Geology Seminar. Investigations of current and classic geological literature. Assigned readings and reports. Participated in by members of the teaching staff and advanced students. First and second semesters (1). Professor Miller.

Geol. 124. Advanced Petrography. A critical study of recent advances in petrographic methods and nomenclature; preparation of detailed reports on selected problems. Prerequisites: Geol. 1, 3 or 4, 5, and 112. Second semester (3). Dr. Fraser.

Geol. 128. Crystal Structure. A course in the molecular and atomic structure of metals, crystalline minerals, and chemical salts and the point group system of space lattices. Assigned reading of the recent literature on the subject. Designed for students in physics, chemistry, metallurgy, and geology who are interested in X-ray investigation and modern theory of atomic structure. Prerequisites: *Consent of instructor;* Chem. 1 and 11, Math. 1, Phys. 1, or their equivalents. First semester (2). Associate Professor Fretz.

Phys. 150 and 151, Geophysics, are given in cooperation with the department of Geology.

For Graduates

Geol. 220. Geological Investigation. The investigation and study of the literature of some special geological problem. Field and laboratory work on some district; map of a limited area; an investigation of the stratigraphic and structural features of the strata present; presentation of a thesis or dissertation embodying these results. Preparation required dependent upon the nature of the problems to be studied. Prospective students for this course should first consult the professor in charge. First semester (4). Professor Miller, Dr. Whitcomb, Dr. Fraser.

Geol. 221. Geological Investigation. Continuation of Geol. 220. Second semester (4). Professor Miller, Dr. Whitcomb, Dr. Fraser.

Geol. 222. Advanced Economic Geology. Advanced work in ore deposits. Study of the literature and of the theories of ore deposition, together with detailed work on the type occurrences of some of the metallic or non-metallic minerals; thorough investigation and report on some mining district with special regard to the origin of the ores and such commercial aspects of the deposits as may depend chiefly on the geology; preparation and microscopic study of specimens of ores. Prerequisites: Geol. 7 and 108. First semester (3) to (6). Professor Miller, Dr. Fraser.

Geol. 223. Advanced Economic Geology. Continuation of Geol. 222. Second semester (3) to (6). Professor Miller, Dr. Fraser.

Geol. 225. Advanced Physiography. The detailed study of physiographic types and processes. Conferences, reports, and thesis, with work in the laboratory and field. Prerequisite: training in elementary physiography and general geology. First semester (4). Dr. Whitcomb.

Geol. 226. Advanced Physiography. Continuation of Geol. 225. Second semester (4). Dr. Whitcomb.

Geol. 227. Physical Crystallography. An advanced course in the geometrical and physical properties of crystals with special reference to the Goldschmidt method of crystal measurement and projection. Prerequisites: Geol. 1, Phys. 6 and 7. Second semester (2). Associate Professor Fretz.

Geol. 229. Coal Research. A study of the constitution of coal, embracing a review of the literature and the preparation and microscopical examination of thin sections and polished surfaces. First and second semesters (3). Professor Miller, Dr. Fraser.

Geol. 230. Advanced Paleontology. A course in which selected groups of fossils are studied in detail, emphasis being placed upon a knowledge of the literature, generic and specific differences, identification, description, and preparation of fossils. First semester (3). Dr. Whitcomb.

GERMAN

PROFESSOR PALMER, ASSOCIATE PROFESSOR MORE, ASSISTANT PROFESSOR KEGEL

Ger. 1. ELEMENTARY GERMAN. First and second semesters (3).

Ger. 2. ELEMENTARY GERMAN. Continuation of Ger. 1. Prerequisite: *Ger. 1 or the equivalent.* Second semester (3).

Ger. 3. INTERMEDIATE GERMAN. German prose and poetry. Outside reading. Composition. Prerequisite: *one year of college German or entrance German A.* First semester (3).

Ger. 4. INTERMEDIATE GERMAN. Continuation of Ger. 3. Prerequisite: *Ger. 3 or the equivalent.* Second semester (3).

Ger. 7. GERMAN OF CHEMISTRY. Rapid reading of selected texts on chemistry. Prerequisite: *one year of college German or entrance German A.* First or second semester (3).

Ger. 9. ADVANCED GERMAN, PROSE AND POETRY. Rapid reading of representative texts; collateral reading. Prerequisite: *two years of college German or entrance German B.* First semester (3).

Ger. 10. GOETHE'S FAUST. Study of Part 1. Lectures on the origin and development of the Faust story; collateral reading. Prerequisite: *Ger. 9 or high standing in Ger. 3, 4, or 7.* Second semester (3).

Ger. 22. CONVERSATION AND COMPOSITION. Advanced German grammar, German composition, and conversation. Prerequisite: *Ger. 10 or high standing in Ger. 3, 4, or 7.* Second semester (3).

For Advanced Undergraduates and Graduates

Ger. 111. NINETEENTH CENTURY GERMAN DRAMA. Lectures, reading, reports on assigned work. Prerequisite: *Ger. 10 or the equivalent.* First semester (3). Professor Palmer, Associate Professor More.

Ger. 112. NINETEENTH CENTURY GERMAN DRAMA. Continuation of Ger. 111. Prerequisite: *Ger. 10 or the equivalent.* Second semester (3). Professor Palmer, Associate Professor More.

Ger. 113. Lessing, Goethe, and Schiller. Prerequisite: *Ger. 10 or the equivalent.* First semester (3). Professor Palmer.

Ger. 114. Lessing, Goethe, and Schiller. Continuation of Ger. 113. Prerequisite: *Ger. 10 or the equivalent.* Second semester (3). Professor Palmer.

Ger. 115. The German Short Story. Origin and development. Rapid reading of illustrative stories, with particular attention to Gottfried Keller, Theodor Storm, C. F. Meyer, and Paul Heyse; lectures and reports. Prerequisite: *Ger. 10 or the equivalent.* First semester (3). Assistant Professor Kegel.

Ger. 116. The German Short Story. Continuation of Ger. 115. Prerequisite: *Ger. 10 or the equivalent.* Second semester (3). Assistant Professor Kegel.

GOVERNMENT

See History and Government

GREEK

PROFESSOR GOODWIN

Gk. 1. Elementary Greek. For freshmen and sophomores who have entered without Greek, but who desire to take up the study in college. They perform in two years approximately the amount of work required for admission from those who present Greek, and are prepared to proceed in the third year with Gk. 15. This course may, at the discretion of the department, be omitted in any year when there are fewer than six applicants. Prerequisite: None, but some knowledge of Latin is highly desirable. First semester (3).

Gk. 2. Elementary Greek. Continuation of Gk. 1. Second semester (3).

Gk. 3. Second-Year Greek. *Anabasis; Iliad* (if time permits); grammar and simple composition. Offered only when Gk. 1 and 2 have been given in the preceding year. Prerequisites: Gk. 1 and 2, or one year of entrance Greek. First semester (3).

Gk. 4. Second-Year Greek. Continuation of Gk. 3. Second semester (3).

Gk. 7. Thucydides. One or more books. Composition. Prerequisites: Gk. 15 and 16. First semester (3).

Gk. 8. Tragedy. Euripides, *Medea, Bacchae,* or another play. Sophocles, *Oedipus Tyrannus, Antigone,* or another. Literary study of the drama; poetical language, style, and conception; metrical reading; composition. Prerequisites: Gk. 15 and 16. Second semester (3).

Gk. 9. Dramatic Poetry (continued). Aeschylus, *Agamemnon* or *Prometheus Bound.* Aristophanes, *Clouds, Frogs,* or *Birds.* Aristophanes as humorist and as moralist, with consideration of the tendencies which he satirized. Metres. Elementary text-criticism. Prerequisites: Gk. 15, 16, and 8. First semester (3).

Gk. 10. Greek Oratory. Selections from the earlier Attic orators and Demosthenes. Rapid reading, the student being supposed to have reasonable facility in understanding the Greek directly without rendering into English. Attention is directed largely to those points which illustrate the development of Greek prose style. Prerequisites: Gk. 15 and 16. Second semester (3).

Gk. 11. Homer. Rapid reading of considerable portions of the *Iliad* or the *Odyssey.* Homeric language, syntax, and metre reviewed with some reference to the needs of intending teachers, but chiefly as a foundation for the study outlined in Gk. 12. Prerequisites: Gk. 15 and 16. First semester (3).

Gk. 12. Lyric Poetry. Fragments of the Elegiac, Iambic, and Melic poets; selections from Pindar or Theocritus. Prerequisites: Gk. 15, 16, and 11. Second semester (3).

Gk. 13. Hellenistic Greek. *New Testament.* Selections from Lucian. To be substituted on occasion for Gk. 12. Prerequisites: Gk. 15 and 16, and the approval of the professor. Second semester (3).

Gk. 15. Homer and Heroditus. *Iliad* I.-III., or selected books of the *Odyssey.* Herodotus,—selections. Study of the forms and syntax of the Homeric and Ionic dialects; grammatical analysis; reading aloud of Greek; sight-reading; composition. Prerequisites: Gk. 1, 2, 3, and 4, or entrance Greek. First semester (3).

Gk. 16. Plato. *Euthyphro*, *Apology*, or other shorter dialogues. Grammar and composition as in the first semester. Prerequisite: Gk. 15. Second semester (3).

Courses Gk. 9 and 11, 10 and 12 (or 13) are offered in alternate years, and are open to both juniors and seniors.

Candidates for honors in Greek are assigned special readings on request.

For Graduates

Candidates must satisfy the professor of Greek as to their adequate preparation for advanced work. Ordinarily at least four years of Greek in college is expected as a prerequisite. The following are specimen courses, and others may be arranged. Only one course will be given in any one semester.

Gk. 201. Greek Poetry. The development of poetry in Greece from Homer to the drama, with special study of the lyric poets, and collateral reading. First semester (3). Professor Goodwin.

Gk. 202. Greek Poetry. Continuation of Gk. 201. Second semester (3). Professor Goodwin.

Gk. 203. Greek Philosophy. The history of philosophic thought in Greece, particularly in the pre-Socratic period. Ritter and Preller's *Historia Philosophiae Graecae*, and collateral reading. First semester (3). Professor Goodwin.

Gk. 204. Greek Philosophy. Continuation of Gk. 203. Second semester (3). Professor Goodwin.

Gk. 205. Hellenistic Greek. Portions of the *Gospels* in a comparative study, the *Acts*, and selected *Epistles*. Chapters from the *Septuagint*. Patristic literature. Collateral reading. Selections from Lucian. First semester (3). Professor Goodwin.

Gk. 206. Hellenistic Greek. Continuation of Gk. 205. Second semester (3). Professor Goodwin.

HISTORY AND GOVERNMENT

PROFESSORS GIPSON AND S. M. BROWN,
ASSOCIATE PROFESSORS HARMON AND SCHULZ

HISTORY

Hist. 7. History of England to 1603. A study of early Britain, the Anglo-Saxon Heptarchy and customs, the Norman Conquest, development of parliament, continental wars, and the War of the Roses. Not given in 1934-1935. First semester (3).

Hist. 8. History of England to 1603, Continued. The Tudor dynasty; the breaking-up of the mediæval economy, the Reformation, rise of the middle class, mercantilism, and the era of exploration. Not given in 1934-1935. Second semester (3.)

Hist. 9. History of England, 1603 to Date. The Stuarts and the protectorate; the new social conditions; conflict between king and parliament; the puritan revolution; Cromwell and the protectorate. To alternate with Hist. 7. First semester (3).

Hist. 10. History of England, 1603 to Date, Continued. Continental policy in the eighteenth century; the coming of empire; the industrial revolution; political appearance of the cabinet; colonial expansion. To alternate with Hist. 8. Second semester (3).

Hist. 13. United States History. The era of constitution-making; the evolution of political parties; foreign relations during the wars of the French revolutionary period; the western movement and western state-building; the growth of sectionalism. First semester (3).

Hist. 14. United States History. The war for the Union; the reconstruction of the South; the era of big industry and labor combinations; the United States as a world power; the new national paternalism. Second semester (3).

Hist. 25. European History. A rapid survey of the major historic forces from the collapse of the Roman Empire to the sixteenth century. Emphasis placed upon the cultural aspects of mediæval society. First semester (3).

Hist. 26. European History. Continuation of Hist. 25. A more detailed account of historic developments in the eighteenth and nineteenth centuries with an attempt to set forth the more imporant political antecedents of the World War. Second semester (3).

Hist. 27. European Expansion and Empire-Building, 1492-1820. This course consists of a study of certain aspects of the phenomenon of the spread of European civilization and empire into the continents of America, Asia, and Africa. The following topics are emphasized: the progress of discovery, exploration, and settlement; European relations with the native peoples; the evolving of the imperial systems in the sixteenth and seventeenth centuries; imperial rivalries of the eighteenth century; the disintegration of the old empires of France, Spain, and England in the eighteenth and nineteenth centuries. First semester (3).

Hist. 28. European Expansion and Empire-Building, 1492-1820. Continuation of Hist. 27. Second semester (3).

Attention is called also to the following courses in History offered by other departments: Ancient History by the department of Latin; Industrial Evolution by the department of Economics and Business Administration.

For Advanced Undergraduates and Graduates

Hist. 115. The Renaissance. The decline of mediævalism; revived study of the humanities; influence on literature, art, religion, and society. A seminar course; admission by permission only. First semester (3). Professor Brown.

Hist. 116. The Reformation. Continuation of Hist. 115. The revolt within the church; its spread to Germany; Luther; Melanchthon; Calvin; the sixteenth century commercial revolution; nationalist tendencies. Prerequisite: Hist. 115. Second semester (3). Professor Brown.

Hist. 117. The French Revolution. The precursors of the Revolution: Quesnay and the physiocrats, the "intellectuals," Montesquieu, Voltaire, Rousseau; social and financial chaos. A seminar course; admission by permission only. Not given in 1934-1935. First semester (3). Professor Brown.

Hist. 118. The French Revolution. Continuation of Hist. 117. The Revolution: political and constitutional changes; the spirit of the Jacobins; the Reign of Terror; reactions within France and beyond the Rhine; the submersion of the Republic in the Empire. Second semester (3). Not given in 1934-1935. Professor Brown.

Hist. 119. Seminar. Open to students of senior standing who desire to major in history or who have shown ability in the field of humanistic studies. A brief period of history is studied intensively. Subject: The British Empire Before the American Revolution. First semester (3). Professor Gipson.

Hist. 120. Seminar. Continuation of Hist. 119. Second semester (3). Professor Gipson.

Hist. 122. England under Elizabeth. Queen Elizabeth and her contemporaries, with a discussion of social, political, and economic backgrounds. Prerequisite: junior standing. Summer session (3). Professor Brown.

Hist. 123. England under the Stuarts. A course designed to give a general view of the constitutional and political development of the seventeenth century; a survey of social England. Summer session (3). Professor Brown.

Hist. 129. American Foreign Policy. The French alliance; independence and boundaries; commercial restrictions; French Revolution and neutrality; purchase of Louisiana; War of 1812; acquisition of Florida; Monroe Doctrine; relations with France and Great Britain; Oregon and Texas; the Mexican War; manifest destiny; Isthmian diplomacy; China and Japan. Prerequisite: junior standing. First semester (3). Associate Professor Harmon.

Hist. 130. American Foreign Policy. The Civil War and possible European intervention; Alaska boundary; War with Spain; the new Caribbean policies; the World War; the League of Nations; Washington Conference; the aftermath of the Great War. Second semester (3). Associate Professor Harmon.

Hist. 131. The Culture of the Middle Ages. An attempt to appreciate the fusion of the Classical, Christian, and Teutonic

elements which shaped the cultural life of the Middle ages. Particular emphasis is placed upon the daily life and habits of men and women rather than upon political experience and military activity. Prerequisite: junior standing. First semester (3). Professor Brown.

Hist. 132. The Culture of the Middle Ages. Continuation of Hist. 131. An inquiry into feudal and peasant society; monasticism; industry and the gilds; art and architecture; amusements; food and clothing; poor- and sick-relief; the theory and practice of Christianity. Prerequisite: junior standing. Second semester (3). Professor Brown.

Hist. 133. The Culture of Modern Europe. A study of the cultural phases of the fifteenth, sixteenth, and seventeenth centuries with emphasis upon the social life of the people. Prerequisite: junior standing. Not given in 1934-1935. First semester (3). Professor Brown.

Hist. 134. The Culture of Modern Europe. Continuation of Hist. 133 but dealing with such cultural phenomena as the baroque, the rococo, and rationalism. Particular attention is paid to the industrial revolution and the economic and social theories which accompanied it. Prerequisite: junior standing. Not given in 1934-1935. Second semester (3). Professor Brown.

Hist. 139. The Civil War. Background of the Civil War; Buchanan's policy; Lincoln's attitude; views of Davis; Northern and Southern leaders contrasted. Prerequisite: junior standing. Not given in 1934-1935. First semester (3). Associate Professor Harmon.

Hist. 140. Reconstruction of the Union. Problems of a restored Union; the policy of Johnson; views of the North and South; radical reconstruction; the election of Grant; the Supreme Court and reconstruction; the restoration of white supremacy in the South. Prerequisite: junior standing. Not given in 1934-1935. Second semester (3). Associate Professor Harmon.

Hist. 149. Hispanic America in the Nineteenth Century. Successful movements for independence, recognition, types of governments formed in South, Central, and Caribbean America, wars and revolutions, problems pertinent to foreign trade, ap-

plication of the Monroe Doctrine and its acceptance. Prerequisite: junior standing. First semester (3). Associate Professor Harmon.

Hist. 150. Hispanic America in the Twentieth Century. Continuation of Hist. 149. Results of the Spanish-American War, Theodore Roosevelt and "big stick" diplomacy, Panama Canal and world trade, debts and interventions, Pan-Americanism, World War and its influence, recent United States relations with Latin America. Prerequisite: junior standing. Second semester (3). Associate Professor Harmon.

Hist. 175. Leading Figures in European History. A series of biographical studies, treating of men and women in church and state from Charlemagne to Napoleon. Emphasis is cultural rather than purely historical. Summer session (3). Professor Brown.

For Graduates

Students desiring to major in history and government should have had at least twelve semester hours in connection with their undergraduate work that bear upon this field of study or in other ways should satisfy the department that they are in a position to undertake profitably the required program for the master's degree. Students should register for graduate work only after consultation with the head of the department.

Hist. 201. English Institutional History. A study of political, social, economic, and religious institutions which have most profoundly influenced American civilization. Not given in 1934-1935. First semester (3). Professor Brown.

Hist. 202. English Institutional History. Continuation of Hist. 201. Not given in 1934-1935. Second semester (3). Professor Brown.

Hist. 211. English Colonization in North America in the Seventeenth Century. The activities of the great overseas trading companies; the problem of proprietorial control; the decline of the chartered colonies; conflicts between opposing political, economic, and religious ideals within the colonies. Not given in 1934-1935. First semester (3). Professor Gipson.

Hist. 212. English Colonization in North America in the

SEVENTEENTH CENTURY. Continuation of Hist. 211. Not given in 1934-1935. Second semester (3). Professor Gipson.

Hist. 213. AMERICA IN THE EIGHTEENTH CENTURY. The workings of the English mercantile system; the evolution of colonial institutions; the international struggle for the fur trade in North America; George III and the new administrative system. Not given in 1934-1935. First semester (3). Professor Gipson.

Hist. 214. AMERICA IN THE EIGHTEENTH CENTURY. Continuation of Hist. 213. Not given in 1934-1935. Second semester (3). Professor Gipson.

Hist. 215. AMERICAN CONSTITUTIONAL HISTORY. The major problems involved in the growth of the powers of the national government. Not given in 1934-1935. First semester (3). Associate Professor Harmon.

Hist. 216. AMERICAN CONSTITUTIONAL HISTORY. Continuation of Hist 215. Not given in 1934-1935. Second semester (3). Associate Professor Harmon.

Hist. 217. AMERICA AS A WORLD POWER. The relations of the United States with Latin America; the problem of the Pacific; the United States and Europe. Summer session (3). Associate Professor Harmon.

Hist. 218. AMERICA AS A WORLD POWER. Continuation of Hist. 217. Summer session (3). Associate Professor Harmon.

Hist. 225. PENNSYLVANIA HISTORY. In this course various aspects of eighteenth century Pennsylvania hisory are studied, such as the evolution of the institutions of government, the relations of the settlers to the proprietors, the land policy, the Indian policy, the relations of the various racial groups and religious groups toward one another and toward the provincial government, the relations of Pennsylvania and her colonial neighbors. Summer session (3). Professor Gipson.

Hist. 226. PENNSYLVANIA HISTORY. Continuation of Hist. 225. Summer session (3). Professor Gipson.

Hist. 227. RESEARCH METHODS IN THE SOCIAL SCIENCES. This course is concerned primarily with the technique of research along the lines of historical method. It includes training in

the critical handling of documentary materials, in measuring the value of evidence, and in formal presentation of the results of research. Required of all graduate students in history and government. Open to seniors by permission. First semester (3). Professor Gipson, Professor Brown.

Hist. 228. Research Methods in the Social Sciences. Continuation of Hist. 227. Second semester (3). Professor Gipson, Professor Brown.

GOVERNMENT

Govt. 41. Nineteenth and Twentieth Century Diplomacy. The expansion of the leading European nations in the direction of the economic and political mastery of Africa and Asia. The development of conflicting imperialistic systems and the creation of alliances for the maintenance of the balance of power. Prerequisite: junior standing. First semester (3).

Govt. 42. The World War and its Aftermath. The causes of the war, the chief areas of conflict, the causes for the collapse of the central powers, the peace of Versailles and the problem of world reconstruction. Prerequisite: junior standing. Second semester (3).

Govt. 51. American Government (National). The evolution of the constitution; distribution of powers between the national government and the states; citizenship; nomination, election, and powers of the President; the machinery of legislation; the courts and the constitution. First semester (3).

Govt. 52. American Government (State). The position of the states in the union; state constitutions; the executive, legislative, and judicial branches of state government; current criticisms and suggested reforms; instruments of popular control; the various forms of local government. Second semester (3).

Govt. 60. International Politics. In this course the following topics, among others, are considered: state systems of the ancient world, the emergence and evolution of the European state system and its transferal to the western hemisphere, capitalism and the states, nationalism and the states, international disputes and their settlements, war in world so-

ciety, the politics of peace. Throughout this course the influence of scientific advance and especially of technology upon competing state systems is emphasized. Prerequisite: junior standing. Not given in 1934-1935. Second semester (3).

Govt. 61. Diplomacy in the Nineteenth and Twentieth Centuries. This course deals with the expansion of the leading European nations in the direction of the economic and political mastery of Africa and Asia. The development of alliances, the catastrophe of the World War and subsequent world reconstruction are studied. Not given in 1934-1935. First semester (3).

Attention is also called to the courses in Roman Law and Roman Political Institutions offered by the department of Latin.

For Advanced Undergraduates and Graduates

Govt. 151. The American Constitutional System. An advanced course in the constitutional basis of American government with emphasis upon the principles of the federal system, the organization and powers of the national government, and the relation of the government to the individual in such matters as the protection of persons accused of crime, the protection of contracts, and due process of law. Prerequisite: junior standing. Summer session (3). Associate Professor Schulz.

Govt. 157. Problems of Municipal Management. A study of the various factors involved in the efficient conduct of city government. Special emphasis given to the working of the city manager type of government. First semester (3). Associate Professor Schulz.

Govt. 158. Problems of Municipal Management. Examination of the fundamental principles of effective administration; a survey of such municipal problems as city planning, health control, urban transportation, police and fire protection, water supply, and waste collection and disposal. Second semester (3). Associate Professor Schulz.

Govt. 161. International Law. Consideration of the rules governing the conduct of states in their relations with one an-

other in time of peace. Prerequisite: junior standing. First semester (3). Associate Professor Schulz.

Govt. 162. International Law. Continuation of Govt. 161. With regard to the relations between states in the event of war. Prerequisite: junior standing. Second semester (3). Associate Professor Schulz.

Govt. 163. Problems in Political Authority. Analysis of the basic concepts of political science: state, government, sovereignty, law, liberty, rights; consideration of monarchy, aristocracy, democracy, and the presidential and cabinet plans of government. Prerequisite: junior standing. Not given in 1934-1935. First semester (3). Associate Professor Schulz.

Govt. 164. Problems in Political Authority. Study of the various theories concerning the proper rôle of the State in society and the ethical justification of political coercion. An examination of the political aspects of anarchism, communism, socialism, Fascism, and political pluralism. Prerequisite: junior standing. Not given in 1934-1935. Second semester (3). Associate Professor Schulz.

ITALIAN

See Romance Languages

INDUSTRIAL ENGINEERING

See Mechanical Engineering

JOURNALISM

See English

LATIN

PROFESSOR WRIGHT, ASSOCIATE PROFESSOR CRUM

Lat. 1a. For freshmen who enter with four years of high-school Latin. Pliny, selected letters. Cicero, selected letters. Development of letter writing among the Romans and its influence on modern literature. Prerequisite: four years of high-school Latin. First semester (3).

Lat. 1b. For freshmen who elect the course after three years of high-school Latin. VERGIL. *Bucolics* and the *Aeneid* I-VI, or selections from OVID. Practice in reading aloud and scansion; training in sight translation; some study of the mythology and religion of Greece and Rome; the influence of Latin poetry upon English literature emphasized. Prerequisite: three years of high school Latin. First semester (3).

Lat. 2. HORACE. Selected *Odes*. Lectures on the history and development of lyric poetry; constant practice in reading the more important lyric metres; memorizing of stanzas and passages from Horace. Prerequisite: Lat. 1a or 1b. Second semester (3).

Lat. 4. LIVY. Selections from the earlier books. Some study of early Roman history and topography. CATULLUS, selected poems. Prerequisites: Lat. 1 and 2. First or second semester (3).

Lat. 11. ENGLISH WORDS DERIVED FROM THE LATIN. A course intended to give the student some familiarity with those Latin words that have contributed most largely in derivatives to the English language and to teach the intelligent use of the English dictionary. Elective for all students; no previous knowledge of Latin required. First semester (3).

Lat. 13. LATIN DRAMA. A study of drama among the Romans; native dramatic performances; indebtedness to Greek drama; the various dramatic forms and their vogue; chief writers; dramatic festivals; the Roman theatre; influences in later literature. Reading of selected plays of Plautus, Terence, and Seneca. Prerequisite: Lat. 2. First or second semester (3).

Lat. 21. ANCIENT HISTORY. A survey of the development of civilization from Paleolithic times to the world empire of Alexander the Great. The first six weeks are assigned to the Stone Ages, the Oriental nations, and the Minoan civilization; the remainder of the semester to Hellenic Greece. In conjunction with an outline of political history, the social, economic, religious, philosophic, artistic, and literary development of the ancient world is stressed, as well as the origin of political institutions. First semester (3).

Lat. 22. ANCIENT HISTORY. Continuation of Lat. 21. The Hellenistic Age. Rome from its origin to 395 A.D. Second semester (3).

Lat. 23. Roman Law. Preliminary lectures on laws and customs of peoples anterior to the rise of Roman law. A study of the development of Roman law from the *Leges Regiae* to the codification by Justinian. Readings and discussions of select portions of the law comparing them with modern law. Some time is given to the influence of Roman law on modern nations. Prerequisite: sophomore standing. Second semester (3).

Lat. 24. Roman Political Institutions. A course dealing with the political institutions established and developed at Rome from the earliest times down to the reign of Diocletian. A descriptive and historical survey of political life at Rome and in its provinces by means of lectures, assigned readings, and special reports. Some consideration of titles and the duties of the state officials during the regal period, the republic, and the empire. Prerequisite: sophomore standing. First semester (3).

Lat. 31. Beginning Latin. Special emphasis on English derivatives and the principles of grammar. First semester (3).

Lat. 32. Caesar. *The Gallic War.* Books I-IV. Prose composition and syntax. Second semester (3).

Lat. 33. Caesar. One or two of the later books of the *Gallic War* or selections from the *Civil War.* Prose composition and syntax, with special emphasis on clause construction. A course designed for students who enter with two years of high school Latin and who elect to continue Latin. Prerequisite: two years of high school Latin. First semester (3).

Lat. 34. Cicero. Orations. Continuation of Lat. 33. Essays: *de Senectute* or *de Amicitia.* Prerequisite: Lat. 33. Second semester (3).

For Advanced Undergraduates and Graduates

Lat. 105. Satire. Selected satires of Horace and Juvenal. Lectures on the history of Roman satire and its influence on modern literature. Study of social conditions under the empire. Prerequisites: Lat. 13 and 4. First semester (3). Professor Wright.

Lat. 106. Roman Prose Writers of the Empire. Selections from the following: Petronius, *Cena Trimalchionis;* Apuleius,

Cupid and Psyche story from the *Metamorphoses;* Suetonius, *Lives;* Seneca, *Moral Epistles* and *Dialogues;* Tacitus, *Germania.* Prerequisites: Lat. 13 and 4. Second semester (3). Associate Professor Crum.

Lat. 107. VERGIL. *Aeneid,* Books VII-XII. Continuation of Lat. 108. Prerequisites: Lat. 13 and 4. Not given in 1934-1935. First semester (3). Professor Wright.

Lat. 108. LUCRETIUS. The finest literary passages and selected passages illustrating his philosophy. ENNIUS and some study of early Roman epic. VERGIL'S sixth *Aeneid.* An intensive study of its debt to Greek literature, religion, and philosophy, and its influence on modern literature. Lectures on the history of the epic; collateral reading in the great epics of other literatures. Prerequisites: Lat. 13 and 4. Not given in 1934-1935. Second semester (3). Professor Wright.

Lat. 109. LATIN PROSE COMPOSITION. Exercises in translating from English into Latin with a collateral study of Latin grammar. Special attention to clause construction and other points of syntax. Students preparing to teach Latin are expected to elect this course. Prerequisites: Lat. 13 and 4. First or second semester (3). Associate Professor Crum.

Lat. 110. THE TEACHING OF HIGH SCHOOL LATIN. Discussion of aims, content, and methods, and of the standard texts used in preparatory school Latin, with a consideration of the report of the Classical Investigation, of Lodge's *Vocabulary of High School Latin,* and of Byrne's *Syntax of High School Latin.* Students preparing to teach Latin are expected to elect this course. Prerequisites: Lat. 4 and 13. First or second semester (3). Associate Professor Crum.

Lat. 121. THE ROMAN REPUBLIC. Special emphasis on governmental and social problems of the last two centuries B. C. and the Hellenistic Greek background of the Roman Empire. Prerequisites: Lat. 21 and 22. Not given in 1934-1935. First semester (3). Professor Wright, Associate Professor Crum.

Lat. 122. THE ROMAN EMPIRE TO THE DEATH OF MARCUS AURELIUS. Special emphasis upon the development of the principate, and upon the social and economic structure of Rome, the provinces, and the municipalities. Prerequisites: Lat. 21, 22,

and 121. Second semester (3). Not given in 1934-1935. Professor Wright, Associate Professor Crum.

Lat. 125. Latin Literature in English Translation. In this course the student undertakes a study of Latin literature by means of the best English translations. No knowledge of the Latin language is required. The lives of the most important authors are studied and their works read according to the major departments of literature,—history, comedy, epic, lyric, etc. At the same time emphasis is placed on the chronological development of the literature and the historical background necessary to the interpretation of the author's works. Lectures and readings with special reports. Prerequisite: junior standing. First or second semester (3). Associate Professor Crum.

Lat. 127. The Aeneid of Vergil in English Translation. Reading of the entire poem with wide reading in the modern critical literature. Lectures and reports dealing with Vergil's philosophy, technique, sources, and influence on posterity. Not given in 1934. Summer session (3). Professor Wright.

For Graduates

For admission to graduate courses the student must satisfy the department of his fitness and adequate preparation. It is generally preferred that applicants have completed twenty-four semester hours of undergraduate college Latin in an approved college or university.

Lat. 200. Latin Palaeography. History of Latin palaeography from the earliest known Latin writings, tracing the progressive changes in the formation of the letters and methods of writing up to and including the national hands. Extensive practice in reading manuscripts and facsimiles. First semester (3). Associate Professor Crum.

Lat. 201. Latin Epigraphy. Text book supplemented by frequent use of the *Corpus Inscriptionum Latinarum* and the standard texts of some of the longer inscriptions, illustrating Roman political institutions, public and private life, and religion. Not given in 1934-1935. First semeser (3). Associate Professor Crum.

Lat. 202. Topography and Monuments of Ancient Rome. Lectures (usually illustrated) on the origin, growth, and destruction of ancient Rome and on modern methods of identifying extant monuments. Frequent reports based on a detailed study of the discoveries affecting individual sites. Not given in 1934-1935. Second semester (3). Professor Wright.

Lat. 203. Ovid's Fasti. Substantially the whole of the *Fasti*. Lectures on the religion of ancient Rome and numerous reports on the various festivals treated in Ovid's poem and its sources. Second semester (3). Not given in 1934-1935. Professor Wright.

Lat. 205. Roman Epic. Lectures on the history of epic poetry. Intensive study of the *Aeneid* of Vergil and its sources. First semester (3). Associate Professor Crum.

Lat. 206. Roman Epic. Continuation of Lat. 205, including later Roman epic writers. Second semester (3). Associate Professor Crum.

MATHEMATICS AND ASTRONOMY

PROFESSORS FORT, OGBURN, REYNOLDS, AND SMAIL, ASSOCIATE PROFESSORS STOCKER AND LAMSON, ASSISTANT PROFESSORS SHOOK, RAYNOR AND CAIRNS, MESSRS. VAN ARNAM, BEALE, CUTLER, LATSHAW, AND SWAIN

The major in mathematics in the College of Arts and Science consists in all of at least twenty-four semester hours college credit in mathematics. It must include Math. 1, 2 (or 1a, 2a), 3, 4, 5, 6, and 16, except that a student who has entrance credit in plane trigonometry does not take Math. 1, a student who has entrance credit in advanced algebra does not take Math 2, and a student who has entrance credit in solid geometry does not take Math. 16. The twelve hours advanced credit required by the regulations of the College must be from mathematics courses given at Lehigh University other than Math. 15, 16, 20, 1, 1a, 2, 2a, 3, and 4.

The major in mathematics and astronomy consists of at least twenty-four semester hours college credit in mathematics and astronomy. It must include Math. 1, 2 (or 1a, 2a), 3, 4, and 5 and Astr. 2 and 3, except that students having entrance

credit in plane trigonometry or advanced algebra or solid geometry do not take Math. 1 or 2 or 16 as above. The twelve hours advanced credit required shall not include Math. 15, 16, 20, 1, 1a, 2, 2a, 3, 4, or Astr. 1.

A student entering the freshman class in the College of Engineering normally takes Math. 2. If, however, he presents advanced algebra for entrance credit he enters Math. 3, substituting for Math. 2 at some time a mathematics course for which he has the prerequisites or some other free elective.

A placement examination is given each year during freshman week to all freshmen who present plane trigonometry and solid geometry for entrance. Students who do not make a reasonable showing on this examination are required to take Math. 0 instead of Math. 2.

MATHEMATICS

Math. 0. General Review Course in Secondary School Mathematics. Topics in algebra, geometry, and trigonometry are treated. Recitations and conferences. No college credit. First and second semesters.

Math. 1. Plane Trigonometry. First and second semesters (3).

Math. 1a. Unified Mathematics. This course is designed for freshmen in the College of Arts and Science. First and second semesters (3).

Math. 2. Algebra. Beginning with the theory of quadratic equations. Prerequisite: Math. 1 or 1a, or entrance credit in plane trigonometry. First and second semesters (3).

Math. 2a. Unified Mathematics. Continuation of Math. 1a. Prerequisite: Math. 1a. First and second semesters (3).

Math. 3. Analytic Geometry. The usual elementary course treating among other things the straight line and the conic sections. A beginning is made in the study of calculus. Prerequisite: Math. 2. First and second semesters (3).

Math. 4. Elementary Calculus. The formal rules of differentiation and of integration with simple applications. Prerequisite: Math. 3. First and second semesters (3).

Math. 5. Intermediate Calculus. Lengths, areas, and volumes of figures of revolution; double and triple integrals, centers of gravity, moments of inertia, Taylor's theorem, etc. Prerequisite: Math. 4. First and second semesters (3).

Math. 6. Advanced Calculus. Taylor's Theorem in several variables, line and surface integrals, etc.; elementary differential equations. Prerequisite: Math. 5. First and second semesters (3).

Math. 15. Reading Course in Mathematics. Credit not to exceed one hour per semester, total credit not to exceed three hours; approval of program and written report required.

Math. 16. Solid and Spherical Geometry and Spherical Trigonometry. Open to all students, particularly advised for students of astronomy. First and second semesters (3).

Math. 20. Elementary Mechanics. Composition and resolution of forces, conditions of equilibrium for rigid bodies, friction, work, elementary kinematics and kinetics. Prerequisite: Math. 1. First and second semesters (4).

Math. 21. Analytic Mechanics. Differential equations of motion, treatment of forces in space, free and constrained motion of a particle and of masses, with applications to practical problems. Prerequisite: Math. 6. First and second semesters (3).

Math. 41. Mathematics of Finance. Annuities, sinking funds, amortization, etc. Prerequisite: Math. 2 or 2a. First semester (3).

Math. 42. Mathematics of Statistics. Prerequisite: Math. 2 or 2a. Second semester (3).

Math. 43. First Course in Mathematics of Life Insurance. Mathematical theory of life contingency; preparation of life and monetary tables; computation of premiums for various life insurance policies; valuation of policies to meet statutory requirements; mathematical theory of risk and cost of insurance; computation of items for annual reports; valuation of life annuities; computation of periodic premium for various life annuities. Prerequisite: Math. 41. First semester (3).

Math. 51. Advanced Algebra. Complex numbers, theory of equations with applications to classical problems, Sturm's theorem, etc., determinants and the theory of resultants. Prerequisite: Math. 2 or 2a. Second semester (3).

Math. 52. Projective Geometry. Fundamental ideas and theorems of this great geometric method. Prerequisite: Math. 3. Second semester (3).

Math. 51 and 52 are normally given alternating years.

Math. 53. Second Course in Analytic Geometry. More complete treatment of conic sections and higher plane curves than is possible in Math. 3. Additional work on solid analytic geometry. First or second semester (3).

For Advanced Undergraduates and Graduates

Math. 101. Vector Analysis. The theory and methods of vector analysis as applied in physics and pure mathematics. Prerequisite: *Math. 6.* First semester (3). Dr. Latshaw.

Math. 111. Differential Equations. Special solvable nonlinear equations, linear equations, transformations and symbolic methods, solutions in series, Riccati's, Bessel's, and Legendre's equations, partial differential equations. Prerequisite: Math. 6. First semester (3). Assistant Professor Shook.

Math. 112. Differential Equations. Continuation of Math. 111. Fourier series, cylindrical and spherical harmonics. Prerequisite: Math. 6. Second semester (3). Assistant Professor Shook.

Math. 122. Advanced Analytic Mechanics. Prerequisite: *Math. 21.* First semester (3). Assistant Professor Raynor.

Math. 123. Advanced Analytic Mechanics. Continuation of Math. 122. Prerequisite: *Math. 21.* Second semester (3). Assistant Professor Raynor.

Math. 124. Theory of Errors and Least Squares and Empirical Formulas. Probability and its relation to precision, development of the theory of least squares and its application in the study of errors, the formation of empirical formulas from given data. Prerequisite: Math. 6. Second semester (3). Professor Ogburn.

For Graduates

To major in the department of Mathematics and Astronomy and obtain a master's degree in one year, a graduate student must present evidence of having completed the equivalent of the work required in this department of students in the College of Arts and Science who major in mathematics or mathematics and astronomy. Graduate students who cannot satisfy these requirements but who desire to major in mathematics or mathematics and astronomy may take preliminary courses for which they are prepared, but cannot expect to complete the requirements for a master's degree in one year.

Math. 200. Fundamental Concepts of Mathematics. Not given in 1934-1935. First semester (3). Professor Fort.

Math. 209. Mathematics Seminar. Reports on special topics of the literature of mathematics and of individual research. Prerequisite: graduate standing and consent of the instructor. Given when there is sufficient demand. (3). Professor Fort, Professor Reynolds, Professor Smail, or Associate Professor Lamson.

Math. 210. Mathematics Seminar. Continuation of Math. 209. (3). Professor Fort, Professor Reynolds, Professor Smail, or Associate Professor Lamson.

Math. 211. Infinite Processes. Fundamental limit notions applied to various infinite processes. Not given in 1934-1935. (3). Professor Fort.

Math. 212. Infinite Processes. Continuation of Math. 211. Not given in 1934-1935. (3). Professor Fort.

Math. 215. Theory of Functions of a Complex Variable. (3). Professor Smail.

Math. 216. Theory of Functions of a Complex Variable. Continuation of Math. 215. Prerequisite: Math. 215. (3). Professor Smail.

Math. 217. Theory of Elasticity. Theory of stress and strain. Tension and thrust with applications. Bending of rods and plates. Equilibrium of curved rods, cylinders, and spheres. (3). Professor Reynolds.

Math. 218. Theory of Elasticity. Continuation of Math. 217. (3). Professor Reynolds.

Math. 219. Selected Topics in Quantum Mechanics and Relativity. Newton's equations; Lagrange's equations; Hamilton's equations; Hamilton's partial differential equation; the wave equation of optics; Schrödinger's work, with incidental introduction of characteristic functions of second order ordinary differential equations; the hydrogen atom in the normal state and perturbed state; the theory of the Stark-effect in the new mechanics; the work of Dirac and others. The relativity part of the course is of the conventional type. Not given in 1934-1935. (3). Associate Professor Lamson.

Math. 220. Selected Topics in Quantum Mechanics and Relativity. Continuation of Math. 219. Not given in 1934-1935. (3). Associate Professor Lamson.

Math. 221. Aerodynamics. Introduction to hydrodynamics, equations of motion, Bernoulli's theorem, steady flow around obstacles, vortex theory. Application to wing and propeller theories, lift and drag; dynamics of the airplane, stability and control. Prerequisite: Math. 21. First semester (3). Assistant Professor Shook.

Math. 222. Aerodynamics. Continuation of Math. 221. Second semester (3). Assistant Professor Shook.

Math. 223. Differential Geometry. The differential geometry of curves and surfaces. Prerequisite: Math. 6. Not given in 1934-1935. First semester (3). Dr. Cutler.

Math. 224. Differential Geometry. Continuation of Math. 223. The differential geometry of surfaces and Riemann spaces; tensor analysis. Not given in 1934-1935. Second semester (3). Dr. Cutler.

Math. 225. Operational Calculus. The classical method of solution of the differential equations of the type used in the electric circuit theory; various proofs of the superposition theorem, of the infinite integral theorem, and of the Heaviside expansion theorem; approximate methods; operators, their interpretation and application of a theorem of Borel; applications of the Fourier integral and transforms; fractional-order

derivatives; series expansions of operators; Volterra's theorem; asympototic series; Wiener's applications of a generalized Fourier integral to operational calculus; Paul Levy's treatment. Numerous applications to electric circuit problems are stressed throughout the course. Prerequisite: Math. 111. Second semester (3.) Assistant Professor Cairns.

Math. 227. Finite Differences and Difference Equations. The calculus of finite differences, the difference equation in the domain of real variables with special reference to the linear recurrent relation, boundary value and oscillation theorems, applications to mechanics and electrical theory. Prerequisite: Math. 6. First semester (3). Professor Fort.

Math. 228. Linear Difference Equations. Continuation of Math. 227. The linear difference equation in the domain of the complex variable, existence theorems, etc. Prerequisite: Math. 227 and a course in the theory of functions of a complex variable. Second semester (3). Professor Fort.

ASTRONOMY

Astr. 1. Descriptive Astronomy. An elementary course, open to all students. May not be substituted for Astr. 2. First and second semesters (3).

Astr. 2. General Astronomy. (a) The solar system, the sidereal system; two hours a week. (b) Practical work in the observatory, acquiring facility in use of instruments in actual astronomical observation; one hour a week. (c) Conference. Preparation for (b) and interpreting results, study of star charts and stellar spectra; one hour a week. Prerequisite: Math. 4. First semester (3).

Astr. 3. Practical Astronomy. Instruments used; methods of taking and reducing observations to determine time, latitude, and azimuth; observatory work in which each student makes his own observations and computations in illustration of the theory studied. Prerequisites: Astr. 2, Math. 5. Second semester (3).

For Graduates

Astr. 201. Astronomy Seminar. The mathematical theory of instruments and methods used in the determination of time,

latitude, longitude, and azimuth; practical work in the observatory, to give facility in making and reducing observations. Prerequisite: Astr. 3. Given when there is a sufficient demand. (3). Professor Ogburn.

Astr. 202. Astronomy Seminar. Continuation of Astr. 201. (3). Professor Ogburn.

MECHANICAL ENGINEERING AND INDUSTRIAL ENGINEERING

PROFESSORS F. V. LARKIN. KLEIN, BUTTERFIELD, AND STUART, ASSOCIATE PROFESSOR LUCE, ASSISTANT PROFESSOR JENNINGS, MESSRS. CONNELLY AND THOM

MECHANICAL ENGINEERING

M.E. 1. Elementary Machine Design. Application of the principles of statics and elasticity to the design of power transmission machinery. Some graphical solutions and detailing on the drawing board. Prerequisite: *C.E. 1.* First and second semesters (3).

M.E. 2. Elementary Heat Engines. Fuels, combustion, steam boilers and furnaces, properties of steam, power plant auxiliaries, heat engine cycles, steam engines, steam turbines, internal combustion engines. Prerequisites: *Chem. 1, Phys. 1.* First semester (3).

M.E. 4. Elementary Machine Design. Continuation of M.E. 1. Prerequisite: *C.E. 1.* Second semester. (3).

M.E. 5. Heat Engines. Continuation of M.E. 2. Prerequisites: *Chem. 1, Phys. 1.* Second semester (3).

M.E. 6. Mechanism. A study of the kinematic relations of machine parts. Determination of the relative motion of links in a mechanism; development of cams, gears, and transmission machinery from the standpoint of motion only; practical problems developed in the drawing room. Also a study of force relations in simple machines; the determination of certain forces when others are given; the determination of efficiencies carried on in the drawing room by means of a series of previously prepared plates. Prerequisite: *Math. 20.* Second semester (4).

M.E. 9. Engineering Laboratory. Use and calibration of instruments; elementary tests on steam engines, pumps, and boilers. Prerequisite: *M.E. 2.* Fee, $3.50. First semester (1).

M.E. 10. Thermodynamics. Principles of engineering thermodynamics. Energy equations, entropy, properties of steam and gases, flow of fluids. Application of principles to practical problems. Prerequisite: *M.E. 2 or equivalent.* First and second semesters (3).

M.E. 11. Engineering Laboratory. Continuation of M.E. 9. Laboratory experiments on flow of fluids, tests of steam engines, turbines, air compressors, heat transfer equipment, internal combustion engines. Prerequisite: *M.E. 2.* Fee, $3.50. Second semester (1).

M.E. 15. Thesis. Candidates for the degree of B.S. in M.E. may, with the approval of the department, undertake a thesis as a portion of the work during the second semester of the senior year. Prerequisites: *C.E. 9, M.E. 10.* Second semester (3).

M.E. 19. Engineering Laboratory. A one semester course for non-mechanical students, covering principles of measurements, tests of boilers, steam engines, steam turbines, air compressors, internal combustion engines. Prerequisites: *M.E. 22, 29, or equivalent.* Fee, $3.50. First and second semesters (1).

M.E. 21. Engineering Laboratory. For non-mechanical students. Use and calibration of instruments, tests of steam engines, steam turbines, boilers, air compressors, internal combustion engines, pumping equipment. Prerequisite: *M.E. 22 or equivalent.* Fee, $3.50. First semester (1).

M.E. 22. Heat Engines. For non-mechanical students. Fuels, combustion, properties of steam, steam power plant equipment and cycles, internal combustion engines. Prerequisites: *Chem. 1, Phys. 1.* First semester (3).

M.E. 23. Heat Engines. Continuation of M.E. 22. Prerequisites: *Chem. 1, Phys. 1.* Second semester (3).

M.E. 24. Engineering Laboratory. Use and calibration of instruments, tests of heat tranfer apparatus, prime movers, refrigeration machinery, and power plants in the neighborhood.

Prerequisite: *M.E. 29 or equivalent.* Fee, $3.50. Summer session: eight hours of laboratory work each week-day for four weeks. Tuition fee, $40.00. (4).

M.E. 25. Engineering Laboratory. Continuation of M.E. 21. Prerequisite: *M.E. 22 or equivalent.* Fee, $3.50. Second semester (1).

M.E. 29. Heat Engines. A one semester course for non-mechanical students. Combustion, properties of steam, power plant equipment, internal combustion engines. Prerequisites: *Chem. 1, Phys. 1.* First and second semesters (3).

M.E. 30. Mechanism. A study of the kinematic relations of machine parts. Determination of the relative motion of links in a mechanism; development of cams, gears, and transmission machinery from the standpoint of motion only; practical problems developed in the drawing room. Prerequisite: *Math. 20.* First semester (3).

M.E. 31. Applied Mechanics. Kinematics, kinetics, and elasticity in the design of machine elements. Prerequisite: *M.E. 1.* First and second semesters (3).

M.E. 32. Applied Mechanics. Continuation of M.E. 31. Application of fundamental principles in the design of a complete machine. Prerequisite: *M.E. 4.* Second semester (3).

M.E. 33. Thermodynamics. Principles of engineering thermodynamics. Energy equations, entropy, properties of steam and gases, flow of fluids. Application of principles to practical problems. Prerequisite: *M.E. 2 or equivalent.* First and second semesters (2).

M.E. 34. Thermodynamics. Continuation of M.E. 33. Power plant cycles, steam engines and turbines, compressors, refrigeration, internal combustion engines. Prerequisite: *M.E. 2 or equivalent.* First and second semesters (2).

For Advanced Undergraduates and Graduates

Graduate students desiring to take the following courses should present as prerequisites: integral calculus, mechanics of materials, and elementary heat engines.

M.E. 108. Heat Engines. Continuation of M.E. 10. Thermodynamic analyses of the following: power plant cycles, steam

engine, combustion, compressors, steam turbine, internal combustion engine, refrigeration. Prerequisite: *M.E. 2 or equivalent.* Second semester (3). Professor Klein, Assistant Professor Jennings.

M.E. 112. Advanced Machine Design. The design of machines in general with special attention to the application of underlying fundamentals in strength to specific problems, practical considerations, and the use of standards. Problems covering such machines as hoists, machine tools, hydraulic machines, etc., are worked in a drawing room conducted on the lines of a modern commercial drafting room. Prerequisites: *M.E. 4, C.E. 9.* First semester (4). Associate Professor Luce.

M.E. 113. Mechanical Engineering. Advanced work in internal combustion engines, steam turbines, with typical problems. Prerequisite: *M.E. 10.* First semester (3). Professor Klein, Professor Butterfield.

M.E. 114. Engineering Laboratory. Comprehensive tests of power plant equipment, internal combustion engines, refrigeration machinery. Prerequisite: *M.E. 9.* Fee, $3.50. First semester (2). Professor Stuart, Assistant Professor Jennings.

M.E. 116. Advanced Machine Design. Continuation of M.E. 112, with special emphasis on the effect of eccentric loading and inertia forces on the dimensions of machine parts. Prerequisites: *M.E. 4, C.E. 9.* Second semester (4). Associate Professor Luce.

M.E. 117. Mechanical Engineering. Continuation of M.E. 113. Advanced work in refrigeration, heating, ventilation, air conditioning, and power plant design. Prerequisite: *M.E. 10.* Second semester (3). Professor Klein, Professor Butterfield.

M.E. 118. Engineering Laboratory. Continuation of M.E. 114 supplemented by complete tests of power plants in the vicinity and original investigations. Prerequisite: *M.E. 9.* Fee, $3.50. Second semester (2). Professor Stuart, Assistant Professor Jennings.

Students taking any of the courses in engineering laboratory are subject to call for one twenty-four hour test a semester.

M.E. 119. General Aeronautics. A theoretical course in aerostatics, aerodynamics, aeronautical power plants, and aero-

nautical navigating instruments. Prerequisite: *senior standing in the college of engineering.* First semeter (3). Professor Butterfield.

M.E. 120. General Aeronautics. Continuation of M.E. 119. Prerequisite: *senior standing in the college of engineering.* Second semester (3). Professor Butterfield.

M.E. 121. Advanced Machine Design. Commercial design methods and procedure in the development of machines for unit manufacture and quantity production. Prerequisites: *M.E. 31, C.E. 17.* First semester (3). Associate Professor Luce.

M.E. 122. Advanced Machine Design. Design problems involving dynamics and elasticity; emphasis upon analysis. Prerequisites: *M.E. 31, C.E. 17.* Second semester (3). Associate Professor Luce.

M.E. 124. Advanced Work in Engineering Laboratory. Continuation of M.E. 24. Prerequisite: *M.E. 24 or equivalent.* Fee, $3.50. Summer session: eight hours of laboratory work each work-day for four weeks. Tuition, $40.00. (4). Assistant Professor Jennings.

For Graduates

Math. 217 and 218, Theory of Elasticity, Math. 221 and 222, Aerodynamics, and E.E. 217 and 218, Economics of Electric Power, may be included in a graduate major in mechanical engineering.

M.E. 200. Advanced Engineering Thermodynamics. Energy equations; availability and entropy; general equations; formulation of vapor properties; action of steam in nozzles and turbines; supersaturation; gas properties; gas reactions in combustion. Prerequisite: *graduate standing in engineering.* First semester (3). Professor Klein or Professor Stuart.

M.E. 201. Advanced Engineering Thermodynamics. Continuation of M.E. 200. Second semester (3). Professor Klein or Professor Stuart.

M.E. 203. Internal Combustion Engines. History; laws of mixing, carburation, atomization, combustion, and chemical equilibrium; heat losses; friction losses; governing; gas engine cycles; vibration and balancing; engine types. Prerequi-

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site: *graduate standing in engineering.* First semester (3). Professor Butterfield.

M.E. 204. Internal Combustion Engines. Continuation of M.E. 203. Prerequisite: *graduate standing in engineering.* Second semester (3). Professor Butterfield.

M.E. 207. Steam Turbines. Theory of the steam turbine; classification; discussion of types; operation and governing; principles underlying the design of turbine parts; critical velocities. Prerequisite: *graduate standing in engineering.* First semester (3). Professor Klein.

M.E. 208. Steam Turbines. Continuation of M.E. 207. Prerequisite: *graduate standing in engineering.* Second semester (3). Professor Klein.

M.E. 211. Advanced Engineering Laboratory. Original investigations and advanced testing in the field of mechanical engineering preceded by a study of the methods of precision measurements required. Prerequisite: *graduate standing in engineering, courses in engineering laboratory and thermodynamics.* Fee, $3.50. First semester (3). Professor Stuart or Assistant Professor Jennings.

M.E. 212. Advanced Engineering Laboratory. Continuation of M.E. 211. Prerequisites: *graduate standing in engineering, courses in engineering laboratory and thermodynamics.* Fee, $3.50. Second semester (3). Professor Stuart or Assistant Professor Jennings.

INDUSTRIAL ENGINEERING

I.E. 1. Industrial Employment. Following the junior year, students are required to do a minimum of eight weeks of practical work, preferably as student apprentices, in the work they plan to follow after graduation. A report, typewritten and bound, is required. Prerequisite: *sophomore standing.*

I.E. 2. Industrial Management. A course in the essential problems of organization, financial administration, plant layout, production control, and employment policies of industrial enterprises. Prerequisites: *Bus. 3 and 4.* First semester (3).

I.E. 3. Industrial Management. Continuation of I.E. 2. Prerequisites: *Bus. 3 and 4.* Second semester (3).

In I.E. 2 and I.E. 3 a maximum of three half-day inspection trips a semester is required.

I.E. 4. Industrial Power. Application of the principles of thermodynamics to the design and operation of steam power plants, internal combustion engines, compressors, and refrigeration. One afternoon period weekly devoted to engineering laboratory and inspection and tests of plants in the vicinity of the University. Prerequisites: *Math. 5, M.E. 10.* Second semester (3).

I.E. 5. Thesis. Candidates for the degree of B.S. in Industrial engineering may, with the approval of the department, undertake a thesis as a portion of the work of the second semester of the senior year. Prerequisites: *C.E. 9, Bus. 11.* Second semester (3).

For Graduates

Candidates for the degree M.S. in Industrial Engineering may include in a major program graduate courses in engineering for which they have the necessary prerequisites; also Math. 217, 218, 221, 222, and Psy. 202, 203, 204, 209. The major must include a minimum of twelve hours of graduate courses in technical engineering, at least six of which must be in Industrial Engineering. A thesis may be required. The minor program will normally be taken in the College of Business Administration.

I.E. 200. Management Policies. Analysis of the factors entering into the determination of management policies. Discussion of case material bearing upon the organization, location, growth, size, socialization, and control of types of industries. Prerequisites: *elementary courses in industrial management and psychology.* First semester (3). Professor Larkin.

I.E. 201. Personnel Policies. Analysis of the factors entering into the determination of personnel policies. Discussion of case material bearing on the worker and his relation to industry, selection, health, training, safety, wages, welfare, and retirement. Prerequisites: *six hours in industrial management, applied psychology.* Second semester (3). Professor Larkin.

METALLURGICAL ENGINEERING

PROFESSOR STOUGHTON, ASSOCIATE PROFESSORS BUTTS AND DOAN, ASSISTANT PROFESSOR HARVEY

Met. 1. General Metallurgy. A course of lectures discussing the metallurgical application of physics, chemistry, and economics, and the basic principles and apparatus employed in metallurgical operations. Ores, fuels, combustion, pyrometry, refractories, furnaces, metallurgical processes and products, metals and alloys, slags and fluxes, blast and gases, smoke and fume. Prerequisites: *Chem. 1 or 3, Phys. 1.* First semester (2).

Met. 2. Metallurgy of Iron and Steel. Chemical and physical properties of iron. Iron ores, preparation of ores, the blast furnace, the mixer, remelting, refining, puddling, the Bessemer process, the open-hearth process, duplex process, cementation, manufacture of crucible steel, electric steel, alloy steels, castings, forgings, and heat treatment. Prerequisite: Met. 1, 21, or 23. Second semester (2).

Met. 3. Metallurgy of Copper, Lead, and Associated Metals. Copper: chemical and physical properties, ores, smelting, sulphide ores, converting, treatment of oxide ores, wet process, electrolytic processes, brass and bronze. Lead: chemical and physical properties, ores, smelting processes, condensation of lead fume, refining and desilverization of base bullion. Associated Metals: gold, silver, platinum, selenium and tellurium, bismuth. A two-day inspection trip (expense about $10.00) is required. Prerequisite: Met. 1, 21, or 23. First semester (2).

Met. 4. Metallurgy of Zinc, Aluminum, and the Minor Metals. Zinc: chemical and physical properties, ores, reduction by furnace and electrolytic processes, electrothermic processes, manufacture of zinc oxide. Mercury: chemical and physical properties, ores, processes of extraction. Gold and Silver: amalgamation, cyaniding, refining, properties, alloys. Aluminum: chemical and physical properties, ores, extraction by electrolysis, light alloys. Tin, Nickel, Antimony, etc.: chemical and physical properties, ores, processes of extraction, alloys. A one-day inspection trip (expense about $3.00) is required. Prerequisite: Met. 1, 21, or 23. Second semester (2).

Met. 5. Electrochemistry. Lectures and recitations concerning the phenomena of electrolysis and electrolytic conduction; current phenomena; voltage phenomena; energy relations; electrode reactions; the electrolytic cell; primary cells and storage batteries; electric arcs and discharges through gases. Prerequisites: Chem. 1 or 3, and 20, Phys. 6. First semester (1).

Met. 21. Engineering Metallurgy. An abridgment of Met. 1, 2, 3, and 4, especially adapted to the viewpoint of users of metals. Prerequisites: Chem. 1 or 3, Phys. 1. First and second semesters (2).

Met. 23. Ferrous Metallurgy. Especially adapted from Met. 21 for students taking the curricula in Chemistry and Chemical Engineering. Prerequisites: Chem. 1 or 3, Phys. 1. First semester (2).

Met. 24. Short Course in Non-Ferrous Metallurgy. An abridgment of Met. 3 and 4. Prerequisite: Met. 1, 21, or 23. Second semester (2).

Met. 33. Metallurgical Laboratory. The internal structure of metals and industrial alloys; effect of cold rolling and annealing. Heat treatment of alloys including case-hardening of steels; foundry experiments; fatigue and corrosion testing of metals; duralumin; electric arc welding. Use of instruments and apparatus employed in metallurgical work, such as pyrometers, hardness testing machines, microscopes, gas and electric furnaces, etc. Prerequisites: Phys. 4 and 6, Met. 1, 21, or 23 previously or concurrently. Fee, $5.00. First and second semesters (1).

Met. 34. Metallurgical Laboratory. Continuation of Met. 33. Prerequisites: Phys. 4 and 6, Met. 1, 21, or 23 previously or concurrently. Fee, $5.00. Second semester (1).

Met. 44. Metallurgical Plant Visits. Visits of inspection and study to plants extracting, refining, working, fabricating, treating, or otherwise producing or utilizing metallic bodies in a metallurgical sense. Written reports of visits are required and occasional quizzes on observations made. Prerequisite: Met. 1, 21, or 23. Second semester (1).

Met. 46. Metallurgical Plant Visits. Continuation of Met. 44. Prerequisite: Met. 1, 21, or 23. Second semester (1).

Met. 48. Summer Work. At the end of the sophomore year, eight weeks practical experience in industrial plants is required of students who do not take Chem. 39.

Met. 49. Summer Work. At the end of the junior year students in the curriculum in Metallurgical Engineering who do not take Mil. 9 or 19 are required to secure in industrial plants at least eight weeks' practical experience.

Met. 61. Problems in General Metallurgy. A course of problems embodying the use of physical, chemical, and mechanical principles as the basis of practical metallurgy. Data are taken, as far as possible, from actual practice, so that the results have an important bearing in the understanding of metallurgical processes. Prerequisites: *Chem. 1 or 3, and 8, Phys. 1.* Second semester (1).

Met. 62. Problems in Iron and Steel Metallurgy. A course of problems involving the fundamental principles of the various processes in the metallurgy of iron and steel, to give the student an understanding of the quantitative relationships in the processes. Prerequisites: *Met. 2, 21, or 23 previously or concurrently:* Met. 1 and 61, 81, or 83. Second semester (1).

Met. 81. Short Course in Metallurgical Engineering Problems. An abridgment of Met. 61 and 62. Prerequisites: *Chem. 8, Met. 1, 21, or 23 previously or concurrently.* First and second semesters (1).

Met. 83. Short Course in Metallurgical Engineering Problems. Same as Met. 81, but adapted for students taking the curriculum in Chemical Engineering. Prerequisites: *Chem. 8, Met. 1, 21, or 23 previously or concurrently.* First semester (1).

Met. 84. Short Course in Non-ferrous Metallurgical Problems. An abridgment of Met. 163 and 164. Prerequisites: *Met. 3 or 24 previously or concurrently;* Met. 61, 81, or 83. Second semester (1).

Met. 90. Thesis in Metallurgy. Candidates for the degree of B.S. in Metallurgical Engineering may, with the approval of

the head of the department, undertake a thesis as a portion of the work during the senior year. First and second semesters (2).

For Advanced Undergraduates and Graduates

Met. 108. ELECTROMETALLURGY. Lectures discussing the practical application of electricity to metallurgical processes. Electrolytic and electric furnace plants and practice. Prerequisites: *Met. 1, 21, or 23;* Met. 125. Second semester (3). Associate Professor Butts.

Met. 125. ELECTROCHEMISTRY AND ELECTROMETALLURGY. Lectures and recitations concerning the phenomena of electrolysis and electrolytic conduction; current phenomena; voltage phenomena; energy relations; electrode reactions; the electrolytic cell; primary cells and storage batteries; electric arcs and discharges through gases; electrothermics; practical applications of electricity to metallurgical processes. Prerequisites: Chem. 20, Met. 1, 21, or 23, Phys. 6. First semester (2). Associate Professor Butts.

Met. 130. PHYSICAL METALLURGY. The states of matter; physical structure and constitution of metals; X-rays and crystal structure; effect thereon of mechanical working, heat treatment, composition, etc.; including polishing and examination of microsections and an introduction to metallography; casting, shaping, welding, and testing metal objects. Lectures and laboratory work. Prerequisites: *Chem. 1 or 3, Phys. 1;* Met, 1, 21, or 23. Fee, $5.00. Second semester (3). Associate Professor Doan.

Met. 131. METALLOGRAPHY. Internal structures of alloys as revealed by the constitutional diagram. The X-ray and microscopic methods of studying metal structures. The close relation between structure and properties in industrial alloys such as steel, brass, duralumin, cast iron, stainless steel, etc. Quenching and aging of alloys. Lectures, problems, and laboratory experiments. Prerequisites: *Chem. 1 or 3, Phys. 1;* Met. 1, 21, or 23, and 130. Fee, $5.00. First semester (3). Associate Professor Doan.

Met. 132. METALLURGICAL LABORATORY. Principles of process metallurgy, such as alloying, galvanizing, measurement of air

volume and moisture content, desilverization of lead, cementation of steel, electrolysis, hydrometallurgy, heat transfer, heat conduction, and radiation. Principles of physical metallurgy, such as the effect of mechanical work and heat treatment, influence of impurities, etc. Determination of efficiencies of furnaces. Experiments with electrochemical processes, electric furnaces, etc. Prerequisites: *Met. 33;* Met. 1, 2, 3, 125, and 130 or 131. Fee, $10.00. Second semester (2). Associate Professor Butts, Associate Professor Doan, Assistant Professor Harvey.

Met. 135. ELECTROCHEMICAL LABORATORY. Quantitative relations in the deposition of metals by electrolysis. Experimental study of the conditions controlling the nature of electrolytic deposits, electrolysis of fused salts, cathodic and anodic reactions. Prerequisites: Chem. 20, Met. 1, 21, or 23, Phys. 6, Met. 5 or 125 previously or concurrently. Fee, $5.00. First semester (1). Associate Professor Butts.

Met. 137. SEMINAR. Conference hours of the staff of the department with students, to discuss current metallurgical literature, processes, and problems; involving reading of current English and foreign literature and verbal presentation by the students. Training in the preparation and presentation, both oral and written, of engineering reports. Prerequisites: *Met. 1, 21, or 23;* Met. 2 and 130. First semester (1). Associate Professor Doan.

Met. 138. SEMINAR. Continuation of Met. 137. Prerequisites: *Met. 1, 21, or 23;* Met. 2, 3, and 130; one year of a modern foreign language. Second semester (2). Associate Professor Doan.

Met. 152. ADVANCED METALLURGY OF IRON AND STEEL. Continuation of Met. 2 for seniors and graduate students. Prerequisite: Met. 2. Second semester (2). Professor Stoughton.

Met. 153. ADVANCED METALLURGY OF IRON AND STEEL. Prerequisites: Met. 2 and the approval of the department head. First and second semesters (1). Professor Stoughton.

Met. 154. ADVANCED METALLURGY OF IRON AND STEEL. Prerequisites: Met. 2 and the approval of the department head. First or second semester (1). Professor Stoughton.

Met. 163. Problems in the Metallurgy of Copper, Lead, Gold, and Silver. A course of problems concerned with the principles utilized in the metallurgy of copper, lead, silver, and gold. Prerequisites: *Met. 61, 81, or 83, and 3 or 24 previously or concurrently;* Met. 62. First semester (1). Associate Professor Butts.

Met. 164. Problems in the Metallurgy of Zinc, Aluminum, and the Minor Metals. A course of problems concerned with the principles utilized in the metallurgy of zinc, aluminum, etc. Prerequisites: *Met. 61, 81, or 83, and 4 or 24 previously or concurrently;* Met. 62 and 163. Second semester (1). Associate Professor Butts.

Met. 172. Advanced Physical Metallurgy. A selective course including advanced study in the fundamental fields with a review of the current literature as the study in each field is concluded. Prerequisites: *Met. 130 and 131 previously or concurrently.* First semester (2). Associate Professor Doan.

Met. 173. Advanced Physical Metallurgy. Continuation of Met. 172. Prerequisites: *Met. 130 and 131 previously or concurrently.* Second semester (2). Associate Professor Doan.

For Graduates

Chem. 236 and 237, X-Ray Research, may be included in a graduate major in metallurgy.

Met. 201. Metallurgical Investigation and Thesis. Study of the literature and investigation of some special metallurgical problems, such as: an improvement or innovation in some metallurgical process; the establishment of an equilibrium diagram of a series of alloys; the effect of heat treatment on a metal or alloy; or some other contribution to metallurgical knowledge, or else confirmation of knowledge not yet fully established. The study and investigation must be embodied in a written report. Prerequisites: Met. 2, 3, or 4. First and second semesters (6). Professor Stoughton. Associate Professor Butts, Associate Professor Doan, Assistant Professor Harvey.

Met. 202. Metallurgical Investigation and Thesis. Continuation of Met. 201. First and second semesters (3). Professor Stoughton, Associate Professor Butts, Associate Professor Doan, Assistant Professor Harvey.

MILITARY SCIENCE AND TACTICS

MAJOR GREEN, CAPTAINS SADLER, KECK, RICE, AND TOW, SERGEANTS GASDA, O'BRIEN, AND DUBY

An infantry unit of the Reserve Officers' Training Corps was established at Lehigh University in September, 1919. Conducted on a voluntary basis during the year 1919-1920, the unit had a membership of 313 students. A year later the trustees and faculty of the University made the Basic Course, Military Science and Tactics, a required subject, under the R.O.T.C. regulations, for physically fit freshmen and sophomores.

An ordnance unit was established at this University in September, 1925. For Basic Ordnance students the course is the same as for Basic Infantry. For Advanced Ordnance, students in the College of Engineering are eligible, preference being given to those in Mechanical, Chemical, Metallurgical, and Electrical Engineering.

The miliary courses included under the War Department regulations consist of two years of basic work and two years of advanced work along specialized lines. Students who complete the four-year course satisfactorily become eligible for commissions as second lieutenants in the Officers' Reserve Corps.

Uniform and equipment are furnished by the Government; each student must provide suitable shoes and belt. Each student to whom government property is issued is required to make a cash deposit of $25.00, which is refunded in full upon the return of the property in good condition; this deposit is payable at the time of registration for the first semester. During the advanced course students are paid commutation of uniform and subsistence, amounting to approximately $9.00 a month. The number of students who may take the advanced course is limited by the annual appropriations.

Infantry students make inspection trips to West Point in the fall and to Gettysburg battle field in the spring of the senior year. Ordnance students make an inspection trip to Picatinny Arsenal and to Gettysburg battlefield in the spring of the junior year and to Frankford Arsenal in the fall of the senior year.

Infantry Unit

Mil. 1. Basic Course, First Year, Fundamental military training common to all arms of the service. Theoretical and practical instruction in map reading, marksmanship, military courtesy, military hygiene and first-aid, physical drill, and command and leadership. Three hours a week. First semester (2).

Mil. 2. Basic Course, First Year. Continuation of Mil. 1. Second semester (2).

Mil. 3. Basic Course, Second Year. Fundamental military training common to all arms of the service. Theoretical and practical instruction in leadership, musketry, automatic rifle, scouting and patrolling, and combat principles of rifle squad. Students who indicate suitable proficiency in this course are appointed corporals in the R.O.T.C. unit. Three hours a week. First semester (2).

Mil. 4. Basic Course, Second Year. Continuation of Mil. 3. Second semester (2).

Mil. 5. Advanced Course, Infantry, First Year. Theoretical and practical instruction in leadership, field engineering, airplane photographs, infantry weapons (machine gun, 37 mm. and 3 in. trench mortor), combat principles, rifle and machine gun section and platoon. Students who indicate suitable proficiency in this course are appointed sergeants in the R.O.T.C. unit. Five hours a week. First semester (3).

Mil. 6. Advanced Course, Infantry, First Year. Continuation of Mil. 5. Second semester (3).

Mil. 7. Advanced Course, Infantry, Second Year. Theoretical and practical instruction in mechanization and motorization, principles of camouflage, organized Reserve Corps regulations, administration, military history and national defense act, combat principles, tactical exercises, map problems, command and leadership, and military law. Students who indicate suitable proficiency in this course are appointed commissioned officers in the R.O.T.C. unit and upon graduation are appointed second lieutenants in the Infantry Officers' Reserve Corps. Five hours a week. First semester (3).

Mil. 8. Advanced Course, Infantry, Second Year. Continuation of Mil. 7. Second semester (3).

Mil. 9. Advanced Camp, Infantry. Compulsory for students who elect the advanced course. Generally held in summer between junior and senior years. (3).

Ordnance Unit

Mil. 11. Basic Course, First Year. Same as Mil. 1. First semester (2).

Mil. 12. Basic Course, First Year. Continuation of Mil. 11. Same as Mil. 2. Second semester (2).

Mil. 13. Basic Course, Second Year. Same as Mil. 3. First semester (2).

Mil. 14. Basic Course, Second Year. Continuation of Mil. 13. Same as Mil. 4. Second semester (2).

Mil. 15. Advanced Course, Ordnance. First Year. Five hours a week, three hours of which are credited to technical courses in the regular engineering curricula. Two hours' instruction weekly is given in the following military subjects: materiél, ammunition and explosives, current ordnance problems. Students who indicate suitable proficiency in this course are appointed sergeants in the R.O.T.C. unit. First semester ($1\frac{1}{2}$).

Mil. 16. Advanced Course, Ordnance, First Year. Continuation of Mil. 15. Second semester ($1\frac{1}{2}$).

Mil. 17. Advanced Course, Ordnance, Second Year. Five hours a week, three hours of which are credited to technical courses in the regular engineering curricula. Two hours' instruction weekly is given in the following military subjects: property accounting and ordnance financial procedure, military law, administration and supply, organization of the Ordnance Department, industrial mobilization, current ordnance problems, elementary ordnance engineering. Students who indicate suitable proficiency in this course are appointed officers in the R.O.T.C. unit and upon graduation are appointed second lieutenants in the Ordnance Officers' Reserve Corps. First semester ($1\frac{1}{2}$).

Mil. 18. Advanced Course, Ordnance, Second Year. Continuation of Mil. 17. Second semester ($1\frac{1}{2}$).

Mil. 19. Advanced Camp, Ordnance. Compulsory for students who elect the advanced course. Generally held in summer between junior and senior years. (3).

Mil. 20. Advanced Ordnance. Drill and command. Elective for students taking Mil. 15. First semester ($\frac{1}{2}$).

Mil. 21. Advanced Ordnance. Continuation of Mil. 20. Second semester ($\frac{1}{2}$).

Mil. 22. Advanced Ordnance. Continuation of Mil. 21. First semester ($\frac{1}{2}$).

Mil. 23. Advanced Ordnance. Continuation of Mil. 22. Second semester ($\frac{1}{2}$).

MINING ENGINEERING

PROFESSOR ECKFELDT, ASSOCIATE PROFESSOR SINKINSON

Mine. 1. Mining Engineering. Prospecting: modes of occurrence of minerals; uses of geology; prospecting for placers, veins, and beds; geophysical prospecting (see Phys. 150 and 151); drilling; sampling; valuation of property; location of claims; patenting mining ground. Boring: uses of bore-holes; methods—percussion and rotation; survey of bore-holes. Transportation: haulage; surface and underground methods; ropes, motors, and cars; aerial tramways; loading and unloading; storage of mineral; transportation of workmen; mine tracks; signaling; hoisting; motors, ropes, receptacles; safety appliances; systems of hoisting. Prerequisite: Geol. 3 or 4. First semester (3).

Mine. 2. Mining Methods. Exploitation: methods of working deposits; location of surface plant; rock-drilling, tools and machines; air compressors; use of explosives and blasting; safety regulations; quarrying; tunneling, slope and shaft sinking; timbering; support of excavations by wood, steel, and concrete; methods of mining; stripping; hydraulicing; dredging; room and pillar; longwall; stoping; filling; caving; top-slicing; robbing; coal cutting machinery; conveyors; mechanical loaders. Prerequisite: Geol. 3 or 4. First semester (3).

Mine. 3. Ore Dressing; Coal Preparation; Laboratory. General principles and physical properties upon which the recovery of minerals from ores is based, followed by detailed study of machines and apparatus used for coarse and fine crushing; classifying and preparation for concentration; various methods of concentration, including gravity and magnetic methods, oil flotation, etc. Study of procedure followed for treatment of ores in typical concentrating plants; visits to mills; experimental work in ores, giving practical application of principles and processes covered. General principles of concentration applied to the preparation of coal. Visits to breakers and coal washers. A well-equipped laboratory affords opportunity for individual as well as class operation of machines and and apparatus. Prerequisite: Geol. 1 or 1a. Fee, $5.00. First semester (3).

Mine. 5. Mining Engineering. Drainage: surface water, prevention of access; mine dams; tunnel drainage; mechanical drainage, water-hoisting, pumping, classes of pumps. Ventilation: mine air; vitiation of air; natural and mechanical methods of ventilation; systems, multiple entry, splitting; ventilating machines, fans and blowers; testing air; ventilation laws. Lighting: methods in use, safety lamps, electric lighting; safety regulations. First aid: causes of accidents, means of prevention, rescue work; first aid to injured; hygiene of mines. Earthwork, retaining walls, piling, trestles, trackwork. Prerequisites: Mine. 1 and 2. Second semester (3).

Mine. 6. Mine Surveying. Forms for keeping notes; surface surveys; determination of true meridian, latitude, and time from observations on Polaris and sun; U. S. public land surveys, connecting surface surveys with mine surveys through tunnels, slopes, and shafts; calculation of notes; mine mapping; mine problems; practice in mine surveying. Mine railroads: theory of curves; curve and compensation problems. Prerequisite: *C.E. 6*. Second semester (3).

Mine. 7. Construction. Standard construction methods as applied to the use of stone, concrete, brick, steel, wood, etc., in general building operations, erection and rigging; pipework; construction schedules. Prerequisite: junior standing. First semester (2).

Mine. 8. Oil Field Practice. Distribution of petroleum and natural gas; valuation of oil lands. Location of wells; development-drilling and production methods. Transportation; storage; fires; avoidable waste and conservation of oil and gas resources. Refining methods; casing-head gasoline. Prerequisite: Geol. 3 or 4. Second semester (2).

Mine. 9. Mine Administration and Law. Organization, management; principles of mining. Property in mines and minerals; mining leases; rights and liabilities of mine operators; surface and lateral support; disposal of mine refuse and water. Locating and patenting mining ground. Mining law of the United States and foreign countries. Prerequisites: *junior standing;* Mine. 1, 2, 5, and 6. Second semester (1).

Mine. 10. Fuel Technology. Economic, statistical, scientific aspects. Fuel resources. Analysis of fuels, including gas analysis. Calorimetry; pyrometry; radiometry. Classification of fuels. Colloidal fuels. M.E. students take certain parts of this course. Prerequisites: *Chem. 1 or 3 or the equivalent.* First semester (2).

Mine. 11. Fuel Technology. Theoretical aspects and practice in the utilization of fuels, with the incidental methods of laboratory investigation. Chemical composition of fuels; carbonization at low and high temperatures; complete gasification or fuels, with laboratory practice. Prerequisite: *Chem. 1 or 3 or the equivalent.* Second semester (2).

Mine. 12. Fuel Technology Laboratory. Fuel analysis, calorimetry, technical pyrometry, gas analysis, testing the properties of coals and yield of various distillation products at low and high temperatures, extraction of coal by solvents. Prerequisites: *Chem. 1 or 3 or the equivalent;* Chem. 11, 12, 13, or 14. Deposit, $10.00. First semester (1).

Mine. 13. Fuel Technology Laboratory. The chemical and physical examination of liquid fuels, calorimetry, vapor pressure tests of gasoline, viscosity of lubricants by standard methods. Prerequisite: *Chem. 1 or 3 or the equivalent;* Chem. 11, 12, 13, or 14. Deposit, $10.00. Second semester (1).

Mine. 15. Mining Engineering. A general survey of the elements of mining engineering adapted to the needs of students in

the curriculum in Industrial Engineering. Prospecting, boring, excavation and support, exploitation, transportation, drainage, ventilation, lighting, mineral preparation. Prerequisite: *junior standing.* Second semester (3).

Mine. 20. Summer Work. Industrial employment for eight weeks, following the junior year, with report. Prerequisite: *sophomore standing.*

For Graduates

Students desiring to do graduate work in mining engineering should consult with the professor of Mining Engineering with regard to their qualifications.

Mine. 201. Methols of Mining. The study of methods used in a given mining region, or in the production of a given class of materials, with respect to conditions influencing choice of method and cost. First semester (3). Professor Eckfeldt.

Mine. 202. Methods of Mining. Continuation of Mine. 201. Second semseter (3). Professor Eckfeldt.

Mine. 203. Mining Plant. The determination of the efficiency of mining machinery of given types under varying conditions. First semester (3). Professor Eckfeldt.

Mine. 204. Mining Plant. Continuation of Mine. 203. Second semester (3). Professor Eckfeldt.

Mine. 205. Ore-Dressing and Coal Washing Plant. The study of certain operations incident to the dressing of ores or the preparation of coal. Determination of efficiency of machines and processes. Losses in dressing. Fee, $5.00. First semester (3). Associate Professor Sinkinson.

Mine. 206. Ore-Dressing and Coal Washing Plant. Continuation of Mine. 205. Fee, $5.00. Second semester (3). Associate Professor Sinkinson.

Mine. 207. Fuel Technology Research. Physical and chemical investigations of coals and fuel oils; gas analysis; ignition phenomena; mechanism of combustion; surface combustion; heat recuperation. General study of methods employed in carbonizing coal between 500° and 1200° C., including recovery of

by-products; coal-gas and coking industries. Deposit, $15.00. First semester (3). Associate Professor Sinkinson.

Mine. 208. Fuel Technology Research. Continuation of Mine. 207. Deposit, $15.00. Second semester (3). Associate Professor Sinkinson.

MORAL AND RELIGIOUS PHILOSOPHY

PROFESSOR BEARDSLEE

As a prerequisite to graduation the University requires all of its students to take instruction in the philosophy of conduct and religion in order that they may acquire some familiarity with the best thought concerning the spiritual and moral problems of men. The emphasis is continually upon the certainties of knowledge and faith by which men live. The purpose is constructively to help the student to clarify and enrich his own living philosophy of life. This requirement may be satisfied by (a) attendance at chapel on an average of at least three times a week for two years, or (b) satisfactory completion of two courses in this department, or (c) attendance at chapel on an average of at least three times a week for one year and satisfactory completion of one course in this department.

M.R.Phil. 11. Introduction to Moral and Religious Philosophy. Statement and analysis of problems and theories common to philosophy of conduct and philosophy of religion. First and second semesters (1).

M.R.Phil. 12. Philosophy of Conduct. Analysis of such problems as: the terms good and bad, right and wrong; the sources of moral distinctions; responsibility and freedom; progress; happiness. Prerequisite: M.R.Phil. 11. First and second semesters (1).

M.R.Phil. 13. Philosophy of Conduct. Historical and case study of systems of ethics. First semester (1).

M.R.Phil. 14. Philosophy of Conduct. Continuation of M.R.Phil. 13. Prerequisite: M.R.Phil. 13. Second semester (1).

M.R.Phil. 16. Philosophy of Religion. A study of the or igin, nature and validity of religious experience. Prerequisite: M.R.Phil. 11. First and second semesters (1).

M.R.Phil. 17. Comparative Religion. Philosophical study of the source materials and authoritative expositions of living religions in order to orient the students' own convictions in the varieties of effective faith. Prerequisite: M.R.Phil. 11. First and second semesters (1).

M.R.Phil. 18. Comparative Religion. Continuation of M.R. Phil. 17. Prerequisite: M.R.Phil 17 Second semester (1)

CHAPEL

Chapel is not a course or a class but it is regarded by the University as an instructional exercise. It is the intention of the University that sudents who elect chapel may receive from the chapel readings and addresses the same kind of instruction as is given to those who elect courses in philosophy of conduct and the philosophy of religion, but chapel instruction is given in such a place and in such a way as to encourage worship at the will of the individual student.

Chapel exercises ordinarily consist of readings from the literature of ethics and religion, prayers from the literature of various religions, and organ selections from classical music. These exercises are held daily from Monday to Friday, inclusive, from 7:45 to 8:00 a.m. The four possible semester-numbers of chapel are recorded as M.R.Phil.-Chapel 1, 2, 3, 4. All students are invited to attend chapel exercises.

MUSIC

MR. SHIELDS

Mus. 3. History and Appreciation of Music. A study of the development of music from early civilization to the end of the polyphonic period. Illustrated. First semester (3).

Mus. 4. History and Appreciation of Music. A study of the music of the formal period and the romantic period; nationalism and modern tendencies in music. Illustrated. Second semester (3).

Mus. 5. Harmony. A study of the selection and progression of chords. Prerequisite: some knowledge of music. Students should consult the instructor before registering for the course. First semester (3).

Mus. 6. Harmony. Continuation of Mus. 5 and the study of modulation. Second semester (3).

THE LEHIGH UNIVERSITY BAND

Band may be elected by suitably qualified freshmen and sophomores in place of Military Science and Tactics. It is an optional subject for suitably qualified juniors and seniors. The band is drilled according to the methods prescribed for regular army bands by one of the sergeants designated for that purpose by the head of the department of Military Science and Tactics.

The band is required to participate in military ceremonies when called upon by the professor of Miltary Science and Tactics, and also to attend all football games played at home and not more than ten other home games, to be specified by the director of athletics. When it appears for military ceremonies the band is to be considered an integral part of the R.O.T.C. regiment.

Coat and cap of uniform, musical instruments, and music are furnished by the University. Members of the band furnish white flannel trousers. A deposit of $25.00 is required from each member of the band for an instrument or uniform.

Seniors and juniors who qualify for membership in the band may substitute band work for the requirement in physical education; sophomores and freshmen may substitute band work for the requirements in physical education and in military science and tactics. Credit is not given during any semester for both band and either of the above-named subjects. Students desiring to play in the band as volunteers may do so, if qualified, and are entitled to the awards named in the following paragraph:

In addition to the above credits, one year of satisfactory service in the band entitles a student to a watch fob; two years of service, a sweater; three years, $20.00 in cash; and four years, an additional $20.00 in cash.

PHILOSOPHY

PROFESSOR HUGHES, ASSISTANT PROFESSOR F. C. BECKER

Phil. 3. Introduction to Philosophy. A systematic approach to the several types of problem which philosophic inquiry brings to the fore. Textbook and collateral readings; discussions. First and second semesters (3).

Phil. 17. CURRENT PHILOSOPHICAL PROBLEMS. Study centers upon current hypotheses of cosmic and biologic evolution. Reports are made on books and articles of general interest. Underlying philosophic issues arise in the course of discussion. Prerequisite: junior standing. First semester (3).

For Advanced Undergraduates and Graduates

Phil. 101. HISTORY OF PHILOSOPHY: ANCIENT. From the beginnings of scientific and philosophical reflection in Ionia to the breakdown of the ancient world. A textbook is employed to systematize and give continuity to the subject matter, but several of the more important dialogues of Plato are studied in detail, together with selections from Aristotle, and collateral readings in translations from other ancient philosophers. Lectures, class discussions, and recitations. Prerequisite: junior standing. First semester (3). Assistant Professor Becker.

Phil. 102. HISTORY OF PHILOSOPHY: MEDIÆVAL AND MODERN. Mediæval philosophy is treated by textbook and by lectures, while attention is given chiefly to the development of modern thought in the seventeenth, eighteenth, and nineteenth centuries with detailed study of some representative works in this period and collateral readings of others. Lectures, class discussions, and recitations. Prerequisite: junior standing. Second semester (3). Assistant Professor Becker.

Phil. 107. SEMINAR IN CONTEMPORARY PHILOSOPHY. Devoted chiefly to philosophy since 1900 in the English speaking countries, with some attention to the related movements in France, Germany, and Italy. Each student prepares during the year a paper on each of three contemporary philosophers representing diverse tendencies. Prerequisite: six hours in philosophy. First semester (3). Assistant Professor Becker.

Phil. 108. SEMINAR IN CONTEMPORARY PHILOSOPHY . Continuation of Phil. 107. Second semester (3). Assistant Professor Becker.

Phil. 109. THE THEORY OF ART AND OF BEAUTY. An attempt to reach a consistent, inclusive account of the place of the esthetic in the life of man and in social organization and history. Lectures, reports, and discussions. Prerequisite: junior standing. First semester (3). Professor Hughes.

Phil. 110. The Theory of Knowledge. An attempt to trace certain problems of modern thought and science to their source in the "metaphysical heart" of experience. Reports and discussions. As a preliminary study Phil. 114 is desirable but not essential. Prerequisite: junior standing. Not given in 1934-1935. First semester (3). Professor Hughes.

Phil. 111. The Theory of Education. A critical examination of the ideas and ideals involved in the enterprise of education: their validity and their bearing on the facts and theories of individuality, society, progress, and democracy. Educational subject matter and techniques are examined from the point of view of the principles involved. Chiefly readings and class discussions. Prerequisite: junior standing. First semester (3). Professor Hughes.

Phil. 112. The Theory of Human Relations. Social and political philosophy: a critical examination of the classical theories in this field, and their assumptions with regard to human nature, justice, and liberty. Historical and constructive. Readings, class discussions, papers. Prerequisite: junior standing. Second semester (3). Assistant Professor Becker.

Phil. 114. Logic and Scientific Method. An introduction to traditional logic and to modern developments. Some inquiry into the nature of discovery and proof. Prerequisite: junior standing. Second semester (3). Professor Hughes.

Phil. 115. Ethics: The Theory of Conduct. A study of the universal principles advanced for the guidance of conduct. Prerequisite: junior standing. Second semester (3). Assistant Professor Becker.

Phil. 116. The Theory of Nature. The chief problems indicated by current conceptions of nature. Suggestions for the broadening and clarifying of these conceptions. Prerequisite: junior standing. Second semester (3). Professor Hughes.

For Graduates

Prerequisite to major graduate work in philosophy: four undergraduate courses in philosophy or equivalent preparation.

Phil. 201. History of Philosophy. Advanced: Ancient and Mediæval. The course centers in a study of Aristotle, his predecessors and successors, to Thomas Aquinas. Alternating with Phil. 205. First semester (2) or (3). Asistant Professor Becker.

Phil. 202. History of Philosophy. Advanced: Modern. The course this year centers in a study of Kant. The development of Kant's own thought is traced. His dependence upon his precursors is examined and also his influence upon those who succeeded him. Second semester (2) or (3). Professor Hughes.

Phil. 205. Plato. The course deals with the fundamental principles of Plato's thought, their development in the Platonic writings, and the change in the emphasis given to them in later times. Alternating with Phil. 201. First semester (2) or (3). Assistant Professor Becker.

Phil. 206. Spinoza. The *Emendation* and the *Ethics*. The growth of modern naturalism, Spinoza's contribution to the movement, and the subsequent history of the doctrine. Alternating with Phil. 202. Second semester (2) or (3). Professor Hughes.

Phil. 208. Thesis in Philosophy. First semester (2) or (3). Professor Hughes, Assistant Professor Becker.

Phil. 209. Thesis in Philosophy. Second semester (2) or (3). Professor Hughes, Assistant Professor Becker.

THE DIVISION OF ATHLETICS AND PHYSICAL EDUCATION

DIRECTOR KELLOGG

This divsion consists of the department of Intercollegiate Athletics and the department of Physical Education and Intramural Athletics. It has supervision over the entire field of physical education and athletics. Its activities consist of intercollegiate athletics, intramural athletics, required physical education including corrective exercises, and special courses of instruction in preparation for coaching and teaching physical education.

PHYSICAL EDUCATION AND INTRAMURAL ATHLETICS

PROFESSOR REITER, ASSISTANT PROFESSORS BARTLETT AND HARMESON, MESSRS. KANALY AND MAHONEY

The department of Physical Education and Intramural Athletics has supervision and control of the required and recreational physical activities of the student body. The aim of the department is to insure the health and physical development of every student of the University. Facilities for accomplishing this aim are afforded in Taylor Gymnasium, the field house, the two playing levels of Taylor Field, and Lehigh Field.

Each student is given an annual physical examination by the director of the Students' Health Service, assisted by the department of Physical Education. He is advised as to postural and physical defects.

All students are required to take regular exercise under departmental supervision. This requirement calls for two hours a week in the gymnasium or participation, under the oversight of the department, in an organized sport. In the gymnasium work opportunity is offered in the following activities: mass exercises, mass swimming, beginners' swimming, boxing, fencing, apparatus stunts, hand-ball, life saving, and athletic dancing. All undergraduate students must swim seventy-five feet before graduation. Students are encouraged to change their activities whenever it is thought best for their all-round development. A comprehensive program in intramural sports is followed for dormitory, fraternity, interclass, and independent groups, in football, cross-country running, basketball, wrestling, swimming, soccer, track, lacrosse, tennis and baseball. Students are encouraged to participate in these sports rather than in gymnasium exercise. Members of the R.O.T.C. unit substitute one hour of military drill for one of the two hours of required physical education.

Individual exercise is prescribed for the correction of physical and functional defects. Students of this group are carefully examined and individually guided.

The University maintains a well-equipped dispensary for medical treatment. If a student is injured while engaged in any sport he must report as soon as possible to the director of the Students' Health Service.

P.E. 1. Physical Education. Freshman first semester.
P.E. 2. Physical Education. Freshman second semester.
P.E. 3. Physical Education. Sophomore first semester.
P.E. 4. Physical Education. Sophomore second semester.
P.E. 5. Physical Education. Junior first semester.
P.E. 6. Physical Education. Junior second semester.
P.E. 7. Physical Education. Senior first semester.
P.E. 8. Physical Education. Senior second semester.

For Juniors and Seniors

The following courses are open only to juniors and seniors who are preparing for professional careers in teaching and athletic coaching.

P.E. 22. Theory and Practice of Football. Classroom and field instruction in all phases of modern football. Second semester (3).

P.E. 23. The Organization and Administration of Physical Education: Theory. The organization and supervision of physical education programs, including the history of physical education systems, the administration of intramural activities, the qualifications of physical educators, the methods of teaching, and the planning of programs. Second semester (2).

P.E. 24. The Organization and Administration of Physical Education: Practice. The practice of teaching mass physical activities, including athletics, combative events, gymnastic games, apparatus stunts, and efficiency tests. Programs of corrective exercise for postural defects are considered. Three hours practice a week. Second semester (1).

PHYSICS

PROFESSOR BIDWELL, ASSOCIATE PROFESSORS BAYLEY, PETERSEN, AND CARWILE, ASSISTANT PROFESSORS BERGER, FREY, AND C. R. LARKIN. MESSRS. M. EWING. SNAVELY, AND CRARY

Phys. 1. Elementary Physics. Lecture demonstrations and conferences. First and second semesters (4).

Phys. 4. Mechanics, Light, and Sound. Recitations. Calculus methods are employed in this course. Prerequisites: *Phys. 1, Math. 3.* First and second semesters (3).

Phys. 5. Physics Laboratory. Mechanics, light, and sound. Concurrent with Phys. 4. Prerequisites: *Phys. 1, Math. 3.* Fee, $6.00. First and second semesters (1).

Phys. 6. Electricity, Magnetism, and Heat. Recitations. Calculus methods are employed in this course. Prerequisites: *Phys. 1, Math. 3.* First and second semesters (3).

Phys. 7. Physics Laboratory. Electricity, magnetism, and heat. Concurrent with Phys. 6. Prerequisites: *Phys. 1, Math. 3.* Fee, $6.00. First and second semesters (1).

Phys. 12. Introduction to Physics. A survey course for students in the Colleges of Arts and Science and of Business Administration. A brief introduction to the principal fields of physics. Lecture demonstrations, recitations, and laboratory. Fee, $6.00. First semester (3).

Phys. 13. General Physics. Continuation of Phys. 12. Lecture demonstrations, recitations, and laboratory. Prerequisites: Phys. 12, Math. 1 or 1a. Fee, $6.00. Second semester (3).

Phys. 14. General Physics. Continuation of Phys. 13, with more emphasis on recent developments. Lecture demonstrations, recitations, and laboratory. Prerequisite: *Phys. 13.* Fee, $6.00. First semester (3).

Phys. 15. Modern Physics. A non-mathematical introduction to contemporary phenomena and theories. Lectures and recitations. Prerequisite: *Phys. 14.* Second semester (3).

Phys. 50. Industrial Employment. Eight weeks industrial employment during the summer following the junior year with submission of a written report.

For Advanced Undergraduates and Graduates

Phys. 110. Electrical Laboratory. Precise measurements. Prerequisites: *Phys. 6 and 7.* Fee, $6.00. First semester (1). Assistant Professor Larkin.

Phys. 111. Electrical Laboratory. Precise measurements. Continuation of Phys. 110. Prerequisites: *Phys. 6, 7;* Phys. 110. Fee, $6.00. Second semester (1). Assistant Professor Larkin.

Phys. 120. Electric Oscillations and Electric Waves. A course dealing with electric oscillations and waves and high

frequency phenomena. Prerequisites: *Math. 4, Phys. 4, 5, 6, and 7, or 14.* One laboratory and two class periods a week. Fee, $6.00. Not given in 1935-1936. Second semester (3). Assistant Professor Frey, Mr. Snavely.

Phys. 122. PHYSICAL OPTICS AND SPECTROSCOPY. A course dealing with the wave theory of light, interference, diffraction, polarization, etc.; exposition of some phases of spectroscopic phenomena. Prerequisites: *Math. 4, Phys. 4, 5, 6, and 7, or 14.* One laboratory and two class periods a week. Fee, $6.00. Not given in 1934-1935. First semester (3). Assistant Professor Berger.

Phys. 124. ELECTRICAL DISCHARGE THROUGH GASES. A course covering properties of gaseous ions, the experimental data leading to the electron theory, including a study of vacuum tube phenomena, ionization and resonance potential, photoelectricity, etc. Prerequisites: *Math. 4, Phys. 4, 5, 6, and 7, or 14.* One laboratory and two class periods a week. Fee, $6.00. Not given in 1935-1936. First semester (3). Assistant Professor Frey, Mr. Snavely.

Phys. 126. PYROMETRY. High and low temperature measurements. Practical exercises in the use of the thermocouple, the resistance thermometer, the radiation and optical pyrometer, and similar instruments. One laboratory and two class periods a week. Prerequisites: *Math. 4, Phys. 4, 5, 6, and 7, or 14.* Fee, $6.00. Not given in 1934-1935. Second semester (3). Assistant Professor Berger.

Phys. 150. GEOPHYSICS. A course dealing with the application of physical measurements to the study of geologic structures. Special emphasis is placed upon the seismic method. The course is designed for advanced students in geology, mining, and physics. One laboratory period and one lecture each week. Prerequisites: *Phys. 4 and 6, or 12 and 13, Geol. 3 or 4, and 6;* Geol. 1. Fee, $6.00. First semester (2). Dr. Ewing.

Phys. 151. GEOPHYSICS. Continuation of Phys. 150. Theory and field work in gravitational, magnetic, and electrical methods with emphasis on the use of the torsion balance, the dip needle, and the method of equipotentials. Fee, $6.00. Second semester (2). Dr. Ewing.

Phys. 160. Introduction to Modern Physical Theories. A course on recent developments, including Maxwell's field equations, photo-electricity, radiation, the quantum theory, and the structure of the atom. Prerequisites: *Math. 4, Phys. 6 or 14.* First semester (3). Professor Bidwell.

Phys. 161. Introduction to Modern Physical Theories. Continuation of Phys. 160. Prerequisites: *Math. 4, Phys. 6 or 14;* Phys. 160. Second semester (3). Professor Bidwell.

Phys. 162. Introductory Theory of Electricity and Magnetism. Magnetic fields and potentials; electrostatic fields, potentials and capacities; the Maxwell-Thomson theory of lines of force; electromagnetic fields; variable and alternating currents. Prerequisites: Math. 4, Phys. 6. First semester (3). Associate Professor Bayley.

Phys. 163. Introductory Theory of Electricity and Magnetism. Continuation of Phys. 162. Prerequisites: *Math. 4, Phys. 6;* Phys. 162. Second semester (3). Associate Professor Bayley.

Phys. 164. Advanced Laboratory. Laboratory work of research type. Special problems assigned and the student placed very much on his own initiative. Prerequisite: senior standing in Engineering Physics. Fee, $6.00. First semester (1) or (2). Associate Professor Bayley, Dr. Ewing.

Phys. 165. Advanced Laboratory. Continuation of Phys. 164. Prerequisite: senior standing in Engineering Physics. Fee, $6.00. Second semester (1) or (2). Associate Professor Bayley, Dr. Ewing.

For Graduates

The election of purely graduate courses in physics should ordinarily be preceded by such study of the particular field as that presented in courses in the 100 group. A thorough knowledge of the differential and integral calculus is pre-supposed and further accompanying study of mathematics is generally advisable.

Math. 219 and 220, Selected Topics in Quantum Mechanics and Relativity, and E.E. 215 and 216, Vacuum Tubes and their Applications, may be included in a graduate major in physics.

Phys. 200. Introduction to Mathematical Physics. The application of mathematical analysis to physics. The subjects treated include potential theory, hydrodynamics, heat conduction, and wave motion. Not given in 1934-1935. First semester (3). Assistant Professor Larkin.

Phys. 201. Kinetic Theory. The classical considerations of the kinetic theory of gases substantially as in Jäger with some additional applications to electrical phenomena. Not given in 1935-1936. First semester (3). Associate Professor Petersen.

Phys. 202. Thermodynamics. A course devoted principally to classical thermodynamics following Planck. Not given in 1935-1936. Second semester (3). Associate Professor Petersen.

Phys. 203. Theory of Electricity. Electrostatics, electrodynamics, and electromagnetic theory treated principally from the classical viewpoint. Not given in 1935-1936. First semester (3). Associate Professor Carwile.

Phys. 204. Theory of Electricity. Continuation of Phys. 203. Not given in 1935-1936. Second semester (3). Associate Professor Carwile.

Phys. 205. Special Topics in Current Physics. Lectures and discussions of current physical problems. The topics treated are determined by the trend of current theoretical and experimental physics and by the specific interests of the students. First semester (1). Assistant Professor Larkin.

Phys. 206. Special Topics in Current Physics. Continuation of Phys. 205. Second semester (1). Assistant Professor Larkin.

Phys. 207. Theory of Light. The propagation of light, interference, diffraction; the measurement of wave-length, crystal optics; introduction of quantum theories of the interpretation of spectra. This course follows Shuster and Nicholson's *Theory of Optics*. Not given in 1934-1935. First semester (3). Associate Professor Petersen.

Phys. 208. Theory of Light. Continuation of Phys. 207. Not given in 1934-1935. Second semester (3). Associate Professor Petersen.

Phys. 209. Advanced Dynamics. Principles of statics and dynamics; Lagrange's equations with application to particles and rigid bodies, and the theory of oscillations. Not given in 1934-1935. Second semester (3). Assistant Professor Larkin.

Phys. 211. Physics Seminar. Reports on current literature and research in progress. First semester (1). Professor Bidwell.

Phys. 212. Physics Seminar. Continuation of Phys. 211. Second semester (1). Professor Bidwell.

PSYCHOLOGY

PROFESSOR FORD, ASSISTANT PROFESSOR GRAHAM, DR. HARRIS, DRS. HOFFMAN AND KLOPP (LECTURERS)

Psych. 1. Elementary Psychology. The essentials of the science with brief descriptions of the methods of approach. An orientation course in which the student may evaluate the subject matter in relation to his individual needs. Stress is placed upon a presentation of the facts of the total field rather than any narrowly restricted practical application. Lecture demonstrations, recitations, textbook, and manual of group experiments. First and second semesters (3).

Psych. 4. Social Psychology. The characteristics of behavior as affected by other people. The effect on personality of one's family, play-life, school, church, social status, occupation, cultural environment. The role of language, of individual differences, of leadership. Group behavior: crowds, fashion, group antagonisms, public opinion, censorship, propaganda. Prerequisite: Psych. 1. First semester (3).

Psych. 6. Abnormal Psychology. Mental disorders and mental hygiene. The psychology of emotion and temperament. Tests and methods of classification of cases. Especially advised for senior pre-medical students. Readings, discussions, and a series of clinics at the State Hospital. Prerequisite: Psych. 1. Second semester (3).

Psych. 15. Applied Psychology. Tests of vocational aptitude, work and fatigue, motivation, display and persuasion, individual differences, factors that reduce efficiency. Prerequisite: Psych. 1. Second semester (3).

READINGS IN PSYCHOLOGY. Qualified students may pursue a course of readings on some organized topics selected only after consultation with staff members. Professor Ford and Assistant Professor Graham.

For Advanced Undergraduates and Graduates

Psych. 101. PSYCHOLOGY OF INDUSTRIAL PERSONNEL. Psychological techniques in the field of labor management, selection, and employee service. Prerequisites: Psych. 1 and 15. Second semester (3). Professor Ford.

Psych. 106. ADVANCED EXPERIMENTAL PSYCHOLOGY. Representative experiments on nerve functions, reflexes, sensation, instinct, emotion, individual differences and their statistical treatment. Prerequisite: Psych. 1. First semester (3). Professor Ford, Assistant Professor Graham.

Psych. 107. ADVANCED EXPERIMENTAL PSYCHOLOGY. Continuation of Psych. 106. Representative experiments in learning, perception, reaction time, attention, and the higher mental processes. Prerequisite: Psych. 1. Second semester (3). Professor Ford, Assistant Professor Graham.

Psych. 108. CHILD PSYCHOLOGY. How the infant becomes an adult psychologically. Basic principles underlying the development of the normal child. Individual deviation from the average, its measurement and practical consideration of the problems of the unusual child. Discussion of the experimental literature of all age groups. Prerequisite: Psych. 1. First semester (3). Assistant Professor Graham.

Psych. 111. MINOR RESEARCH. Assigned problems for investigation in either applied or pure science psychology, credit depending on the merit of formal written reports. Prerequisite: Psych. 1. First semester (2) or (3). Professor Ford, Assistant Professor Graham, Dr. Harris.

Psych. 112. MINOR RESEARCH. Either a continuation of Psych. 111, or a different problem for investigation. Prerequisite: Psych. 1. Second semester (2) or (3). Professor Ford, Assistant Professor Graham, Dr. Harris.

For Graduates

Evidence of the satisfactory completion of at least three undergraduate courses in psychology is demanded of students who wish to do their major graduate work in psychology.

Psych. 202. Psychological Tests and Measurements. Devised to aid an understanding of various types of tests and their uses, including administration, techniques, and necessary statistical computations. Available facts regarding the assumptions, validity, and reliability of specific tests of intelligence, special abilities, accomplishment, personality, interest, and historical charts are studied with reference to their effective application. Second semester (2) or (3). Assistant Professor Graham.

Psych. 203. Seminar and Thesis in Psychology. First semester (2) or (3). Professor Ford, Assistant Professor Graham.

Psych. 204. Seminar and Thesis in Psychology. Second semester (2) or (3). Professor Ford, Assistant Professor Graham.

Psych. 209. Systematic Psychology. A historical consideration of the development of psychological systems. The Greek roots of modern psychology, the age of religious influences, the rise of empirical psychology, the creation of the modern laboratory. First semester (3). Professor Ford.

Psych. 210. Systematic Psychology. Continuation of Psych. 209. Introspectionistic theories, behaviorism, psychoanalytic theories, associationism versus *Gestalt*, reflexology, and their respective antecedents. Second semester (3). Professor Ford.

Psych. 211. Major Research. Problems for experimental investigation of graduate level are assigned, credit depending on the merit of formal written reports. First semester (3). Professor Ford, Assistant Professor Graham, Dr. Harris.

Psych. 212. Major Research. Either a continuation of Psych. 211, or a different problem. Second semester (3). Professor Ford, Assistant Professor Graham, Dr. Harris.

ROMANCE LANGUAGES

PROFESSOR FOX, ASSOCIATE PROFESSOR TOOHY,
ASSISTANT PROFESSORS H. C. BROWN AND SOTO, MR. SCOTT

FRENCH

Fr. 1. Elementary French. First semester (3).

Fr. 2. Elementary French. Continuation of Fr. 1. Prerequisite: Fr. 1 or the equivalent. Second semester (3).

Fr. 11. Intermediate French. Prose and poetry. Balzac, Flaubert, Daudet, Moliere, Corneille, Racine. Society in the seventeenth century. Drill in speaking and writing. Primarily for students in Arts and Science and Business Administration who have had two years of preparatory school French. Prerequisite: one year of college French or entrance French A. First semester (3).

Fr. 12. Intermediate French. Continuation of Fr. 11. Second semester (3).

Fr. 21. French Classics. Based on the reading of a number of texts selected mainly from seventeenth and eighteenth centuries. While the main emphasis is placed on correct translation, an accurate knowledge of grammatical construction, idiomatic locutions, and the acquisition of volume in the matter of vocabulary, literary values are also considered and outside reading is assigned on relevant chapters in some history of French literature. Prerequisite: Fr. 11. First semester (3).

Fr. 22. French Literature in the Seventeenth and Eighteenth Centuries. Continuation of Fr. 21. Prerequisite: Fr. 11. Second semester (3).

Fr. 31. French Literature in the Nineteenth Century. Prerequisite: Fr. 21. First semester (3).

Fr. 32. French Literature in the Nineteenth Century. Prerequisite: Fr. 21. Second semester (3).

Fr. 93. French Oral Composition. Texts and Methods. A course for students who wish a greater opportunity to practice in the oral and written use of modern French prose. Especially

recommended for those who expect to teach French. Prerequisite: *permission of instructor in charge of the course.* First semester (3).

Fr. 94. French Oral Composition. Texts and Methods. Continuation of Fr. 93. Second semester (3).

For Advanced Undergraduates and Graduates

Fr. 133. Contemporary French Literature. Prerequisite: Fr. 21. First semester (3). Professor Fox.

Fr. 134. Contemporary French Literature. Continuation of Fr. 133. Prerequisite: Fr. 21. Second semester (3). Professor Fox.

Fr. 141. French Literary History. General review of French literature. Reading, lectures, and explanation of texts. Prerequisite: Fr. 21. First semester (3). Professor Fox.

Fr. 142. French Literary History. Continuation of Fr. 141. Prerequisite: Fr. 21. Second semester (3). Professor Fox.

Fr. 145. Seminar. A study of the works of some author or group of authors or of a period. Prerequisite: Fr. 21. First semester (3). Associate Professor Toohy.

Fr. 146. Seminar. Continuation of Fr. 145. Prerequisite: Fr. 21. Second semester (3). Associate Professor Toohy.

Fr. 151. French Literature in the Sixteenth Century and Earlier. Prose and poetry. Rabelais, Montaigne, Marot, Villon, Froissart, Commynes. Prerequisite: Fr. 21. First semester (3). Professor Fox.

Fr. 152. French Literature in the Sixteenth Century and Earlier. Continuation of Fr. 151. Prerequisite: Fr. 21. Second semester (3). Professor Fox.

For Graduates

Prerequisite: Graduate students who major in French must have completed not less than twelve semester hours of French language and literature above the standard intermediate courses. A reading knowledge of Latin and German is desirable; a general knowledge of English literature is required.

Fr. 201. Old French. Grammar, Schwan-Behrens. Earlier texts. *Chanson de Roland.* First semester (3). Associate Professor Toohy.

Fr. 202. Old French. Continuation of Fr. 201. Second semester (3). Associate Professor Toohy.

Fr. 251. The History of the Novel in France. This course traces the growth of the novel as a form of literature and its various transformations. A number of the representative masterpieces of different periods are read, and both their technical qualities and their relation to the social and intellectual environments are studied. Particular attention is given to the preparation and development of realism in the nineteenth century. First semester (3). Assistant Professor Brown.

Fr. 252. The History of the Realistic Novel in France. Continuation of Fr. 251. Second semester (3). Assistant Professor Brown.

Fr. 255. French Social Forces. As exemplified in modern French literature. First semester (3). Mr. Scott.

Fr. 256. French Social Forces. Continuation of Fr. 255. Second semester (3). Mr. Scott.

SPANISH

Span. 1. Elementary Spanish. First semester (3).

Span. 1a. Elementary Spanish. Six hours supervised study and one hour prepared recitation. First semester (3).

Span. 2. Elementary Spanish. Continuation of Span. 1. Prerequisite: Span. 1. Second semester (3).

Span. 2a. Elementary Spanish. Continuation of Span. 1a. Six hours supervised study and one hour prepared recitation. Second semester (3).

By permission of the instructor in charge, Span. 1a and 2a may be substituted for Span. 1 and 2.

Span. 11. Intermediate Spanish. Continuation of Span. 2. Prerequisite: One year of college Spanish or entrance Spanish A. First semester (3).

Span. 12. Intermediate Spanish. Continuation of Span. 11. Second semester (3).

Span. 21. Spanish Novels and Plays. Continuation of Span. 12. Prerequisite: Span. 11. First semester (3).

Span. 22. Spanish Novels and Plays. Continuation of Span. 21. Prerequisite: Span. 11. Second semester (3).

Span. 93. Spanish Oral Composition. A course for students who wish a greater opportunity to practice in the oral and written use of Spanish prose. Especially recommended for those who expect to teach Spanish. Prerequisite: *permission of instructor in charge of course.* First semester (3).

Span. 94. Spanish Oral Composition. Continuation of Span. 93. Second semester (3).

For Advanced Undergraduates and Graduates

Span. 135. Spanish-American Literature. Social and historical forces in the Spanish-American republics as exemplified in the modern literature of those countries. Prerequisite: Span. 21. First semester (3). Assistant Professor Soto.

Span. 136. Spanish-American Literature. Continuation of Span. 135. Prerequisite: Span. 21. Second semester (3). Assistant Professor Soto.

Span. 141. Spanish Fiction of the Sixteenth and Seventeenth Centuries. Study of the novel in the golden age of Spanish literature, especially of Cervantes' *Don Quixote*. Collateral reading in modern Spanish prose dealing with the subject of the course, and reports. Prerequisite: Span. 21. First semester (3). Assistant Professor Soto.

Span. 142. Spanish Drama of the Sixteenth and Seventeenth Centuries. Plays of Lope de Vega, Tirso de Molina, and Calderón. Collateral reading in modern Spanish prose dealing with the subject of the course, and reports. Prerequisite: Span. 21. Second semester (3). Assistant Professor Soto.

Span. 143. Seminar. A study of the works of some author or group of authors or of a period. Prerequisite: Span. 21. First semester (3). Assistant Professor Soto.

Span. 144. SEMINAR. Continuation of Span. 143. Prerequisite: Span. 21. Second semester (3). Assistant Professor Soto.

For Graduates

Prerequisite: Graduate students who major in Spanish must have completed not less than twelve semester hours of Spanish language and literature above the standard intermediate courses. A reading knowledge of Latin and French is desirable.

Span. 201. OLD SPANISH. Ford's *Old Spanish Readings*. First semester (3). Assistant Professor Soto.

Span. 202. OLD SPANISH. Continuation of Span. 201. Second semester (3). Assistant Professor Soto.

Span. 251. THE MODERN SPANISH NOVEL. Works of Galdós, Alarcón, Valera, Pereda, Valdés, Pardo Bazán, Blasco Ibáñez, Valle Inclán, Baroja. Reading, reports, and lectures. First semester (3). Assistant Professor Soto.

Span. 252. THE MODERN SPANISH NOVEL. Continuation of Span. 251. Second semester (3). Assistant Professor Soto.

ITALIAN

Ital. 1. ELEMENTARY ITALIAN. Grammar and composition; rapid reading of easy modern prose. First semester (3).

Ital. 2. ELEMENTARY ITALIAN. Continuation of Ital. 1. Second semester (3).

Ital. 11. INTERMEDIATE ITALIAN. Masterpieces of classic periods. Outside reading. Prerequisites: Ital. 1 and 2. First semester (3).

Ital. 12. INTERMEDIATE ITALIAN. Continuation of Ital. 11. Second semester (3).

GRADUATE INSTRUCTION

GRADUATE BOARD

Charles Russ Richards, M.M.E., Eng.D., LL.D., *President of the University.*

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Harold Prescott Thomas, B.S., Ed.M., Ed.D., *Professor of Education.*

Stanley Judson Thomas, B.S., M.S., M.A., Ph.D., *Professor of Bacteriology.*

Lehigh University offers to qualified students in various branches of literature, science, and technology advanced instruction leading to the degrees of master of arts and master of science. At the present time major work may be taken in

the following fields: Bacteriology, Biology, Chemistry, Civil Engineering, Education, Electrical Engineering, English. French, Geology, Greek, History and Government, Industrial Engineering, Latin, Mathematics, Mechanical Engineering, Metallurgical Engineering, Mining Engineering, Philosophy, Physics, Psychology, and Spanish. In the fields of Business, Economics, and German, minor work only is offered.

Admission to Graduate Standing

A student who has taken the bachelor's degree or a degree in technology at any recognized college, university, or technical institution may be admitted as a graduate student upon securing the approval of the registrar of the University and of the head of the department in which the student intends to do the major portion of his work. A student seeking admission should present to the registrar an official transcript of his record as an undergraduate.

Women are admitted as graduate students on the same terms as men except that registration in courses open to undergraduates ("100" courses) is, except in the summer session, subject to the special approval of the head of the department concerned.

Students of Lehigh University who are within a few hours of meeting the requirements for the baccalaureate degree may, with the special approval of the Graduate Board, enroll for a limited amount of work for graduate credit.

Registration

The registration days for graduate students each semester are the Thursday, Friday, and Saturday following the undergraduate registration days (see calendar). The last day for graduate registration is the tenth day of instruction.

It should be noted that the graduate work itself starts promptly at the beginning of the semester. It is frequently true that graduate courses can only be given if there is a certain minimum demand for them. Delay in enrolling for the course may therefore result in causing the course to be withdrawn for the semester.

Tuition and Fees

The tuition for graduate courses is at the rate of $10.00 per semester hour.

All new students pay, once only, on admission, a matriculation fee of $5.00. Students at graduation pay a graduation fee of $10.00.

A library fee of $2.50 per semester and a health service fee of $6.00 per semester is paid by all students except those registered for fewer than seven semester hours, or those registered for the summer session.

Graduate students are given the option of paying or not paying the athletic fee of $15.00 a year and the student activities fee of $2.50 per semester. If they pay these fees, they obtain the corresponding benefits.

There are also laboratory fees or deposits in laboratory courses to cover the cost of laboratory supplies used by the individual students and to provide for breakage of glassware and instruments. The amounts of these fees and deposits are given in the description of courses in connection with each laboratory course.

Refunds

For University regulations concerning refunds, see page 40.

Requirements for Degrees

Graduate work leading to an advanced degree is taken under the following regulations:

1. All work which is to be credited toward a master's degree must be done in actual and regular attendance at the University.

2. A minimum of thirty semester hours is required for the master's degree.

3. Each candidate for a degree must submit for the approval of the Graduate Board the program of courses he proposes to take to satisfy the requirements for the master's degree. This program must have the approval of the departments concerned.

4. At least eighteen of the required thirty semester hours must be taken in one department which shall be the student's major department or field. The remaining twelve hours are ordinarily taken in one or two other departments, but, with

the approval of the Graduate Board, the entire thirty hours may be taken in the major department. In all cases, however, the work must be taken under at least two instructors, and the distribution of the work shall be made upon the advice and with the approval of the head of the major department.

5. At least twelve of the eighteen semester hours required in the major department and at least fifteen of the thirty semester hours required for the degree must be taken in courses open primarily to graduates ("200" courses).

6. A thesis may be required by the major department. If required, the thesis shall not count for more than six semester hours. Two bound typewritten copies of the thesis (one of which shall be an original copy), approved by the head of the major department, shall be placed in the hands of the secretary of the Graduate Board at least two weeks before the day on which the degree is to be conferred. Information as to the form in which the thesis must be presented may be obtained from the librarian of the University or from the secretary of the Graduate Board.

7. The master's degree is not granted unless the candidate has earned the grade A or B in at least eighteen hours of the work on his program. No course in which the grade earned is less than C is credited toward the degree.

8. Full time employees of the University may not take more than six semester hours of graduate work in any one semester; half time employees may not take more than ten semester hours.

9. Candidates for graduation on University Day file with the Registrar on or before May 15 a written notice of candidacy for the degree, which notice shall bear the Bursar's receipt for the required graduation fee of $10.00; candidates for graduation on Founder's Day file a similar notice of candidacy on or before September 25. Failure to file such notice by the dates mentioned debars the candidate from receiving the degree at the ensuing graduation exercises. A candidate paying his graduation fee and then failing to qualify for graduation may, on application, receive a refund of the fee.

When all requirements have been met, the candidate is recommended by the faculty to the trustees for the master's degree appropriate to the work pursued.

LEHIGH INSTITUTE OF RESEARCH

The Lehigh Institute of Research was organized in 1924 to encourage and promote scientific research and scholarly achievement in every division of learning represented in the organization of the University, and in recognition of the need for further and more exact knowledge in science and in the applications of science to the affairs of modern life.

The purposes of the Institute of Research include (1) the training of men for research work, (2) the publication of the results of investigations, (3) the conduct of general research, (4) the conduct of cooperative research, (5) the conduct of commercial tests and advisory service.

Detailed information concerning the organization and regulations of the Institute of Research are given in a pamphlet which will be furnished on request.

RESEARCH FELLOWSHIPS

Applications for appointment to the following research fellowships may be submitted by graduates in engineering or science of colleges, universities, and technical schools whose requirements for graduation are substantially the same as those at Lehigh University. Applications should be sent to the President of Lehigh University, Bethlehem, Pa., on or before March 1. Each application for a fellowship should be accompanied by a catalogue of the institution from which the applicant was graduated, a certificate of his college work, a statement concerning his practical experience, and any other evidence of his qualifications for the position which he may choose to submit. An applicant must indicate the line of graduate study he desires to undertake and his special qualifications for such work.

Holders of fellowships, who also pursue graduate work at the University, are exempt from the payment of the University tuition fee. Holders of fellowships are not permitted to accept any kind of employment for pay during the period covered by their appointments.

NEW JERSEY ZINC COMPANY RESEARCH FELLOWSHIP

The New Jersey Zinc Company provided funds in 1924 for a research fellowship to be known as the New Jersey Zinc Company Research Fellowship, which is administered under the following regulations:

Appointment to this fellowship is for the period of two academic years, beginning September 1 and ending June 30, with an annual stipend of $600.00 payable in ten installments. Half of the time of the holder of this fellowship must be devoted to research work in the department to which he is assigned; the other half to graduate study leading to a master's degree at the end of the two year appointment provided all University requirements for this degree have been satisfied. The holder of this fellowship is required to devote approximately ninety hours a month independently of University holidays to research work assigned to him in the department to which he is attached.

THE HENRY MARISON BYLLESBY MEMORIAL RESEARCH FELLOWSHIPS

In 1926 Mrs. H. M. Byllesby, widow of Col. H. M. Byllesby, M.E., '75, President of the Byllesby Engineering and Management Corporation, provided an endowment fund for the establishment of the Henry Marison Byllesby Memorial Research Fellowships in Engineering. The income provides for two fellowships which carry an annual stipend of $750.00, payable in ten monthly installments.

Appointments are for two academic years. Half of the time of the holders of these fellowships must be devoted to research work on some problem in electrical, mechanical, or hydraulic engineering, proposed by the President of the Byllesby Engineering and Management Corporation and approved by the Lehigh Institute of Research; the other half to graduate study leading to the degree of Master of Science at the end of the two year appointment, provided all University requirements for this degree have been satisfied.

THE JAMES WARD PACKARD RESEARCH FELLOWSHIP IN ELECTRICAL OR MECHANICAL ENGINEERING

The income from a bequest from James Ward Packard, M.E., '84, provides for a research fellowship in either electrical or

mechanical engineering, with an annual stipend of $600.00 for each of two years of ten months covered by an appointment.

THE C. KEMBLE BALDWIN RESEARCH FELLOWSHIP IN AERONAUTIC ENGINEERING

A fund provided by Mrs. C. Kemble Baldwin as a memorial to her husband, C. Kemble Baldwin, M.E., '95, provides for the occasional appointment of a research fellow in any branch of science having a bearing on the field of aeronautics, with a stipend of $750.00 a year for each of two years of ten months covered by an appointment.

THE HUNT-RANKIN LEATHER COMPANY RESEARCH FELLOWSHIPS IN LEATHER TECHNOLOGY

The Hunt-Rankin Leather Company has established two research fellowships in leather technology, with a stipend of $900.00 each, payable in twelve installments.

THE LAWRENCE CALVIN BRINK RESEARCH FELLOWSHIP IN CIVIL ENGINEERING

A fund provided by the late Mrs. L. C. Brink as a memorial to her husband, Lawrence Calvin Brink, C.E., '94, provides for the occasional appointment of a research fellow in civil engineering with a stipend of $600.00 a year for each of two years of ten months covered by an appointment.

THE ARCHER-DANIELS-MIDLAND COMPANY AND THE WILLIAM O. GOODRICH COMPANY RESEARCH FELLOWSHIPS

Four research fellowships, carrying an annual stipend of $900.00 each, were established in the fall of 1927 by the Archer-Daniels-Midland Company, of Minneapolis, Minn., and the William O. Goodrich Company, of Milwaukee, Wis., for research in linseed and other drying oils.

THE STUDENT CHEMISTRY FOUNDATION

In the spring of 1927 members of the class of 1930 established the Student Chemistry Foundation in honor of Harry M. Ullmann, head of the department of Chemistry. Subsequent

classes have contributed to the fund. This fund provides two research fellowships, for which Lehigh University graduates only are eligible, carrying an annual stipend of $750.00 each.

THE LEHIGH INSTITUTE OF RESEARCH FELLOWSHIPS

Seven fellowships have been established by the trustees of the University, for research in various fields of science and technology. Appointments to these fellowships are for a period of two years of ten months each. The stipend is $600.00 annually.

THE EAVENSON AND LEVERING COMPANY RESEARCH FELLOWSHIP

The Eavenson and Levering Company has established a research fellowship for the study of wool, with a stipend of $750.00 for one year, beginning September 1, 1933.

THE GARRETT LINDERMAN HOPPES RESEARCH FELLOWSHIP IN CIVIL ENGINEERING

A research fellowship in Civil Engineering was established by the late Mrs. Maria B. Hoppes in memory of her son, the late Garrett Linderman Hoppes, C.E., '83. Appointments to this fellowship are for a period of two years of ten months each. The stipend is $600.00 annually.

THE TEXTILE FOUNDATION FELLOWSHIP

The Textile Foundation, with headquarters in Washington, D.C., began its operations in the fall of 1930 and was created to engage in scientific and economic research for the benefit and development of the textile industry and its allied branches, including production of raw materials.

Eighteen research fellowship and scholarship awards in the field of chemistry, physics, biology, and engineering were announced in April, 1932. One of the fellowships is established in the Department of Chemistry and Chemical Engineering of Lehigh University.

ENDOWED FELLOWSHIPS

Research fellowships named in honor of an individual or a corporation offering opportunities for graduate work and training in research in any designated field of study may be established in perpetuity through the payment to the Board of Trustees of $20,000.00. The income from this fund will be

paid to the holder of the fellowship after the deduction of his tuition and laboratory fees. If a bequest for the establishment of a fellowship provides for half-time service as a research assistant in the Institute of Research, the remaining time to be devoted to graduate study, the University will remit the tuition fee and make only such charges against the fund as are necessary to cover the cost of materials, supplies, and apparatus that need to be provided for the work of the fellow.

SUMMER SESSION

The various courses given during the summer are administered by the director of the summer session and a faculty consisting of those teaching in the summer session. All courses are conducted in accordance with the same standards, and may be credited towards a degree on the same basis, as courses given in the first and second semesters. Women are admitted to the summer session either as graduate or as undergraduate students on the same terms as men. Certificates of academic credit are issued, on request, for all courses satisfactorily pursued.

The courses offered during the summer session are arranged in three distinct groups: (1) courses which are an integral part of certain engineering curricula; (2) courses in a large variety of subjects offered primarily for undergraduates who wish to secure advanced credits or to make up deficiencies; (3) professional courses designed primarily for teachers.

The following courses were offered in the summer of 1933. The Summer Session Announcement, containing full description of courses to be offered in 1934, and information concerning admission, fees, etc., will be sent to any address on request.

REQUIRED COURSES IN ENGINEERING

June 5 to July 1

Chem. 39	Assaying, Coal, Gas, and Oil Analysis	(4)
C.E. 6	Land and Topographic Surveying	(4)
M.E. 24	Engineering Laboratory	(4)
M.E. 124	Advanced Engineering Laboratory	(4)

July 3 to July 15

C.E. 7	Railroad Surveying	(2)

OPTIONAL COURSES

July 5 to August 15

Astr. 1	Descriptive Astronomy	(3)
Bus. 1	Industrial Evolution	(3)
Bus. 2	Industrial Evolution	(3)
Bus. 3	Economics	(3)
Bus. 4	Economics	(3)
Bus. 18	Accounting	(3)
Bus. 161	Sociology	(3)
Chem. 1	Elementary Chemistry	(2)
Chem. 3	Intermediate Chemistry	(2)
Chem. 6	Advanced Chemistry	(3)
Chem. 7	Advanced Chemistry	(3)
Chem. 8	Stoichiometry	(1)
Chem. 11	Chemistry Laboratory	(2)
Chem. 12	Chemistry Laboratory	(1)
Chem. 13	Chemistry Laboratory	(2)
Chem. 14	Chemistry Laboratory	(1)
Chem. 20	Qualitative Analysis	(3)
Chem. 21	Qualitative Analysis	(2)
Chem. 134	Radiation Methods	(2)
Chem. 135	Radiation Methods	(2)
Chem. 144	Radiation Methods Laboratory	(1)
Chem. 145	Radiation Methods Laboratory	(1)
C.E. 1	Engineering Drawing	(2)
C.E. 2	Engineering Drawing	(2)
C.E. 8	Mechanics of Materials	(4)
C.E. 9	Mechanics of Materials	(3)
C.E. 10	Materials Testing Laboratory	(1)
C.E. 12	Hydraulics	(3)
C.E. 13	Hydraulics	(2)
C.E. 14	Hydraulics Laboratory	(1)
C.E. 15	Structural Theory: Stresses	(4)
E.E. 1	Principles of Electrical Engineering	(1)
E.E. 2	Direct Current Machinery	(3)
E.E. 3	Dynamo Laboratory, Elementary	(1)
E.E. 4	Alternating Currents, Elementary	(3)
E.E. 5	Dynamo Laboratory, Intermediate, Direct Current	(1)
E.E. 6	Alternating Currents, Advanced	(3)
E.E. 8	Dynamo Laboratory, Intermediate, Alternating Current	(2)
E.E. 50	Dynamos and Motors, General	(2)
E.E. 51	Dynamo Laboratory, Beginning	(1)
E.E. 52	Alternating Currents, General	(2)
E.E. 53	Dynamo Laboratory, Intermediate	(1)

Engl. 1	Composition and Literature	(3)
Engl. 2	Composition and Literature	(3)
Engl. 120	The Nineteenth Century Novel	(3)
Engl. 123	Shakespeare	(3)
Engl. 131	Milton and the Seventeenth Century	(3)
Engl. 220	Graduate Seminar	(3)
Fr. 2	Elementary French	(3)
Fr. 12	Intermediate French	(3)
Fr. 141	French Literary History	(3)
Geol. 1a	Mineralogy	(3)
Geol. 4	General Geology	(2)
Geol. 6	Field Trips	(1)
Geol. 16	Physiography	(3)
Ger. 1	Elementary German	(3)
Ger. 2	Elementary German	(3)
Ger. 10	Goethe's Faust	(3)
Hist. 117	The French Revolution	(3)
Hist. 129	American Foreign Policy	(3)
Hist. 131	The Culture of the Middle Ages	(3)
Hist. 217	America as a World Power	(3)
Lat. 110	The Teaching of High School Latin	(3)
Lat. 125	Latin Literature in English Translation	(3)
Math. 1	Plane Trigonometry	(3)
Math. 2	Algebra	(3)
Math. 3	Analytic Geometry	(3)
Math. 4	Elementary Calculus	(3)
Math. 5	Intermediate Calculus	(3)
Math. 6	Advanced Calculus	(3)
Math. 16	Solid and Spherical Geometry and Spherical Trigonometry	(3)
Math. 20	Elementary Mechanics	(4)
Math. 21	Analytic Mechanics	(3)
M.E. 1	Elementary Machine Design	(3)
M.E. 2	Elementary Heat Engines	(3)
M.E. 4	Elementary Machine Design	(3)
M.E. 5	Heat Engines	(3)
Phil. 3	Introduction to Philosophy	(3)
Phil. 102	History of Philosophy, Mediaeval and Modern.	(3)
Phil. 202	History of Philosophy, Advanced, Modern	(3)
Phys. 1	Elementary Physics	(4)
Phys. 4	Mechanics, Light, and Sound	(3)
Phys. 5	Physics Laboratory	(1)
Phys. 6	Electricity, Magnetism, and Heat	(3)
Phys. 7	Physics Laboratory	(1)
Phys. 12	General Physics	(3)
Phys. 13	General Physics	(3)
Phys. 110	Electrical Laboratory	(1)
Psych. 1	Elementary Psychology	(3)
Psych. 108	Child Psychology	(3)
Span. 2	Elementary Spanish	(3)

PROFESSIONAL COURSES FOR TEACHERS

July 5 to August 13

Educ. 3	Educational Psychology	(3)
Educ. 121	Diagnosis of Reading Difficulties	(3)
Educ. 130	History of Education in Europe	(3)
Educ. 150	Principles of Secondary Education	(3)
Educ. 171	Elementary Educational Statistics	(2)
Educ. 254	Secondary School Curriculum	(2)
Educ. 280	Guidance in Secondary Schools	(3)
Phil. 111	Theory of Education	(3)

BUILDINGS AND GROUNDS

The University occupies nineteen buildings and its grounds cover one hundred eighty acres on the north side of South Mountain, overlooking the valley of the Lehigh River and the city of Bethlehem.

PACKER HALL

Packer Hall is a four-story sandstone building, 215 feet long and 60 feet wide.

The department of Civil Engineering occupies the greater part of the first and second floors. The instrument rooms contain transits, levels, a large geodetic theodolite, plane tables, and other instruments for engineering field work. In the department headquarters is a collection of plans of engineering structures.

The departments of Mathematics and Astronomy, Philosophy, Education, and Psychology are located in this building. The psychology laboratory has the standard equipment for the several courses in experimental psychology and for special research.

THE WILLIAM H. CHANDLER CHEMISTRY LABORATORY

The Chemistry Laboratory is a fire-proof sandstone building, 259 feet long and 44 feet wide, with a wing 62 feet long and 42 feet wide, and with a three-story extension 60 feet long and 37 feet wide.

Laboratory space and equipment are provided for qualitative and quantitative analysis, inorganic chemistry, organic chem-

istry, sanitary chemistry, industrial biochemistry, colloid chemistry, X-ray analysis, gas analysis, the furnace assay of ores, industrial chemistry, and research in chemistry and chemical engineering. A chemistry museum is located in this building.

The trustees of the University named this building the William H. Chandler Chemistry Laboratory in recognition of Dr. Chandler's thirty-five years' service as professor of Chemistry, 1871-1906.

THE PHYSICS LABORATORY

The Physics Laboratory is a four-story sandstone building, 240 feet long and 44 to 56 feet wide. This building is devoted entirely to the department of Physics. Apparatus and other facilities are provided for lecture and laboratory instruction and research. In addition to offices, recitation rooms, and lecture rooms there are several large laboratory rooms, a reading room, machine shop, wood working shop, glass-blowing room, constant-temperature rooms, storage battery room, sound-proof rooms, dark rooms, and several research laboratories. The building is equipped throughout with water, gas, compressed air, and electric power outlets.

THE W. A. WILBUR ENGINEERING LABORATORY AND POWER HOUSE

The W. A. Wilbur Engineering Laboratory and Power House is a two-story sandstone building, 188 feet long and 44 feet wide.

The power plant contains three Babcock and Wilcox straight-tube cross-drum boilers, each rated at 300 boiler horse power; three Coxe chain grate stokers, two turbine driven Sturtevant blowers, and coal, water, and ash handling equipment of modern design. The plant is designed and equipped to provide steam at 250 lbs. pressure to the engineering laboratories, in addition to heating the University buildings. It is so arranged that any boiler can be isolated for laboratory tests for long periods if necessary. From this plant a six-inch line carries steam to the Packard Laboratory at the pressure desired for the laboratory work. Modern safety appliances and measuring equipment have been incorporated.

A coal-storage yard has room for a season's supply of coal, and a system of belt conveyors and bucket-elevators is provided for receiving coal, dumping it on storage pile, and conveying it into the boiler room as needed.

A floor space of 45 feet by 70 feet in the Wilbur Engineering Laboratory is used for the large equipment of the department of Chemical Engineering.

WILLIAMS HALL

Williams Hall, the donation of Dr. Edward H. Williams, jr., of the class of '75, was so named by the trustees of the University in recognition not only of this gift but also of Dr. Williams' long continued and important service to the University as an alumnus and as professor of Mining and Geology.

Williams Hall is a three-story brick building, 186 feet long and 70 feet wide. It contains the offices, class rooms, laboratories, departmental libraries, and museum collections of the departments of Metallurgical Engineering, Geology, and Biology.

THE FRITZ ENGINEERING LABORATORY

The late John Fritz, of Bethlehem, known as the father of the steel industry in the United States, a member of the original Board of Trustees of the University, gave to the University funds for the erection and thorough equipment of an engineering laboratory. The building was designed and erected under the personal supervision of Mr. Fritz. The building is equipped with a general testing section for testing iron and steel, a cement and concrete section, and a hydraulics section. The equipment is used by the Civil Engineering department in connection with courses in mechanics of materials, hydraulics, and cement and concrete.

The Fritz Engineering Laboratory is of modern steel frame construction, 115 feet long and 94 feet wide, with the main central section 65 feet in height, and two side sections of lesser height. An electrically-operated traveling crane, of 10-ton capacity, commands the entire central portion of the building in which the testing of large specimens is carried on.

The general testing section is equipped with an 800,000-pound Riehlé vertical screw testing machine, capable of testing

columns 25 feet long or less, tensile specimens 20 feet long or less, and transverse specimens up to lengths of 30 feet; an Olsen universal testing machine of 300,000 pounds capacity; smaller machines for ordinary tension, compression, transverse, and torsion tests; a cold-bend testing machine, impact and fatigue machines, and a small machine shop. The hydraulics section is equipped with various tanks, weirs, pumps, and other apparatus for studying problems in hydraulics. The cement and concrete section has a large room for the making and testing of specimens and a room for the storage of materials.

THE ECKLEY B. COXE MINING LABORATORY

The Eckley B. Coxe Mining Laboratory is a sandstone building, 100 feet long and 75 feet wide. It is occupied exclusively by the department of Mining Engineering.

The building contains the office of the professor of Mining Engineering, the main lecture room, a locker and wash room, the office of the professor of Ore Dressing and Fuel Technology, a laboratory equipped for fuel research, a balance room, a sampling laboratory and shop.

On the lower main floor are two air compressors, rock drills, a large concentrating table, a Chance coal cleaner, and a motor-generator set. The upper main floor contains a gyratory crusher, rolls, stamp mill, jigs for coal and ore, concentrating table, vanner, and centrifugal roller-mill.

The lower second floor is equipped as a fuel technology laboratory, with chemical work tables and apparatus for coal, gas, and oil analysis, combustion, calorimetry, pyrometry, coal and oil distillation. The upper second floor is arranged for laboratory work in ore dressing and coal preparation. The equipment comprises two magnetic separators, a rod mill, a jig, three types of flotation machines, a small laboratory concentrating table, a small bowl classifier, and a suction filter. A small mine-type ventilating fan with ducts permits air current measurements. A portion of this floor is also used for mine surveying map work.

The laboratory was named by the trustees of the University in memory of Eckley B. Coxe, who was a pioneer and a leader in the profession of mining engineering in this country, and

an active friend and valued trustee of the University from its early days until his death.

CHRISTMAS-SAUCON HALL

During the summer of 1926, Christmas and Saucon Halls were remodelled and joined by the addition of a four-story central building.

Christmas Hall has historic interest as the first building of Lehigh University. It was originally a church, which was purchased from the Moravian congregation. In the earliest years of the University it contained a chapel, lecture rooms, and students' dormitory.

Christmas-Saucon Hall contains the office of the College of Business Administration, the offices, lecture rooms, and recitation rooms of the departments of English and of Economics, Sociology, and Business Administration, the offices and dispensary of the Students' Health Service, and the editorial and business office of the *Brown and White*, student semi-weekly newspaper.

COPPEE HALL

Coppée Hall is the headquarters of the College of Arts and Science. It contains the offices of the College of Arts and Science, a lecture room, and the offices and recitation rooms of the departments of German, Latin, Greek, Romance Languages, History and Government, and Fine Arts.

SAYRE OBSERVATORY

The Sayre Observatory was the gift of the late Robert H Sayre, one of the original trustees of the University.

The Observatory contains an equatorial telescope of six inches clear aperture and of eight feet focus, by Alvin Clark; a zenith telescope of four and one-half inches clear aperture; an astronomical clock, by William Bond & Son; a meridian circle; a prismatic sextant, by Pistor and Martins; an engineer's transit and a sextant, by Buff and Buff. Students in practical astronomy receive instruction in the use of the instruments and in observation.

The land upon which the Observatory stands, consisting of seven acres adjoining the original grant, was presented to the University by the late Charles Brodhead, of Bethlehem.

THE PACKER MEMORIAL CHURCH

The Packer Memorial Church, in which daily chapel exercises are held, was the gift of the late Mrs. Mary Packer Cummings, daughter of the Founder of the University. It was built in 1887.

THE UNIVERSITY LIBRARY

The original library building was erected by the Founder of the University in 1877 as a memorial to his daughter, Mrs. Lucy Packer Linderman. The present Library, constructed on three sides of the original building, is in the collegiate Gothic style of architecture. It contains five times the floor space of the old structure and affords shelving capacity for approximately 500,000 volumes. Space is provided in the reading room and seminars and other special rooms for about 500 readers. Adequate space for the cataloguing departments and other purely administrative functions of the library is provided, together with special rooms for the treasure collection and the Lehigh collection. Eleven seminar rooms are provided for advanced study. The building contains a browsing room and an art gallery. Individual cubicles are provided in the stacks for advanced students and research workers.

208,800 volumes are now upon the shelves. The list of current periodicals numbers about seven hundred and fifty. The library is especially rich, for one of its size, in materials for research in history, American newspapers, and the history of early science, and in the files of technical journals. The library is a depository for government documents.

Small working reference collections for laboratory use are maintained by the departments of Biology, Geology, Chemical, Civil, Mechanical, and Mining Engineering.

The library is open from 8 a.m. to 10 p.m., except on holidays; on Sundays from 2 p.m. to 10 p.m.

The use of the library, with privilege of borrowing books, is offered to all members of the University: faculty, students, and alumni. Students are allowed free access to the books and are encouraged to become familiar with methods of using a library for literary and scientific work. The privileges of the library are also extended to all qualified residents of the city. The library offers its services to the industries located in the community.

The Eckley B. Coxe Memorial Collection

In memory of Eckley B. Coxe, for many years a trustee of the University, Mrs. Coxe presented to the University his technical library, consisting of 727 volumes and 3429 pamphlets. As the working library of a man who was remarkable for the extent and thoroughness of his acquaintance with the whole field of applied science, this collection possesses great value for scientific and engineering students.

The Joseph W. Richards Collection

The Joseph W. Richards Library of Metallurgy and Chemistry, consisting of about 3000 volumes, is located on the second floor of Williams Hall, and is open for use under the supervision of the department of Metallurgy.

TAYLOR HALL

Taylor Hall, the gift of Mr. Andrew Carnegie, is a concrete dormitory with accommodations for 137 students. There are suites of three rooms (a study and two adjacent bedrooms), for two occupants, and a few single rooms. The building was named Taylor Hall by Mr. Carnegie in honor of Mr. Charles L. Taylor, his former partner in business, a graduate of the University in the class of 1876, and a trustee of the University. The rates for the suites of rooms are $100.00 or $120.00 a year for each occupant. The single rooms are $50.00, $65.00, or $80.00 a year.

PRICE HALL

Price Hall furnishes dormitory accommodations for thirty-four students. It was named in honor of Dr. Henry R. Price, an alumnus of the University of the class of 1870, late President of the Board of Trustees.

DROWN MEMORIAL HALL

Drown Memorial Hall was erected by friends and alumni as a memorial to the late Thomas Messinger Drown, LL.D., President of the University from 1895 to 1904. The building is devoted to the social interests of the University students. It contains study, reading, and lounging rooms, an assembly hall, trophy room of the department of Athletics, and the office of the Lehigh Union, the college publications, and the dramatic

and musical organizations. A faculty club room and a cafeteria are located in the basement.

ALUMNI MEMORIAL BUILDING

The Alumni Memorial Building, which is used as the administration building of the University, was erected as a memorial to 1921 Lehigh men who served in the World War, and especially to the forty-six who gave their lives. The cost of erection was raised by subscription from about 1700 alumni. The Memorial Hall contains the records of the Lehigh men who served and those who died, together with mementos of the war.

In the south wing of the building are the offices of the President, the Dean, and the Registrar of the University, and a large faculty committee room. The north wing contains the offices of the Vice-President and Comptroller, the Treasurer, the Bursar, and the Alumni Association, the University Supply Bureau, and a large room used for faculty meetings, receptions, dances, and the meeting of the Alumni Association and of the Alumni Council.

TAYLOR GYMNASIUM AND FIELD HOUSE

In 1913 Charles L. Taylor, E.M., '76, donated to the University the funds required for the erection of a gymnasium and field house.

Taylor Gymnasium adjoins the athletic field. The building is 222 feet long and 73 feet wide. On the ground floor is located the game room, 93 by 70 feet, used for basketball and wrestling. The game room is surrounded by a gallery for spectators. The main gymnasium floor measures 90 by 70 feet. Other rooms in Taylor Gymnasium are the offices of the Director of Athletics and Physical Education, staff offices and measuring room of the department of Physical Education, basketball and handball courts, fencing, boxing, and wrestling rooms, and locker rooms with accommodations for the entire student body.

The gymnasium is equipped with modern appliances for individual and class work in recreative and corrective exercises, calisthenics, and other gymnastics. Adjoining the locker rooms is a swimming pool, 75 by 25 feet, with a depth from 4½ feet to 9½ feet, and with a capacity of 95,000 gallons.

Adjoining the gymnasium and the stadium is the Taylor field house. It is two stories in height, and has dressing rooms, lockers, and shower baths for visiting and Lehigh teams.

TAYLOR FIELD

An athletic field of more than nine acres in area is provided for the accommodation of students who participate in the various outdoor sports. The stadium, located on the lower level, provides football and baseball fields, surrounded by concrete stands having a seating capacity of 12,000. On the upper level there is a practice field for football, baseball, lacrosse, and soccer; also a quarter mile track and a 220-yard straightaway. During the winter months a wooden outdoor running track, twelve laps to the mile, is provided.

LEHIGH FIELD

An additional athletic field of ten acres in area, with field house and covered grandstand, is located about a mile from the University campus. This field is used for intercollegiate tennis and soccer, and for intramural athletic activities.

ARMORY

The Armory contains the offices, class rooms, storage rooms, and indoor rifle and pistol range of the department of Military Science and Tactics.

THE JAMES WARD PACKARD LABORATORY OF ELECTRICAL AND MECHANICAL ENGINEERING

The late James Ward Packard, who was graduated from Lehigh University in 1884 with the degree of Mechanical Engineer, the designer of the first Packard motor car, the founder of the Packard Motor Car Company of Detroit, Michigan, and of the Packard Electric Company of Warren, Ohio, donated $1,200,000.00 for the erection and equipment of an electrical and mechanical engineering laboratory.

The Packard Laboratory, occupied in the fall of 1929, is a five-story steel-framed sandstone building 225 feet long and 180 feet wide. The lobby is finished in Italian travertine. The halls throughout the building are wainscoted with Tennessee marble. An auditorium on the first floor with a seating capacity of 622 is equipped with a moving picture machine and a projection lantern.

The western half of the building is devoted to the work of the department of Electrical Engineering and contains the offices, class rooms, research rooms, and laboratories of the department. The main dynamo laboratory contains over a hundred generators and motors of various types. The high-tension laboratory is equipped with a 150 k.v. and a 60 k.v. testing transformer, a 700 k.v. oscillation transformer, and sources of high d.c. voltage up to 100 k.v. The transients laboratory is provided with six magnetic oscillographs, two cathode-ray oscillographs, two artificial transmission lines, a surge generator, and a photographic dark room. A five-unit harmonic phase-shifting motor-generator set supplies voltages of various frequencies and wave forms for special tests. The communications laboratory has an extensive equipment of high-frequency measuring apparatus, vacuum-tube circuits, speech amplifiers, and a 40/80 meter transmitter used by the Radio Club. The wiring system provides for quick communication and interconnection between any two parts of the building. A portion of the basement is given to the installation of transforming machinery and switchboard for the laboratory power supply.

The eastern half of the building houses the department of mechanical engineering with offices, drawing rooms, class rooms, research rooms, reading and study room, shop, instrument rooms, and laboratories. The general laboratory comprises a series of air compressors, steam engines, turbines, and pumps ranging from the simplest types to the ultra modern turbo-generator. Each unit is provided with the necessary auxiliaries for testing. The internal combustion laboratory contains a range of modern internal combustion engines: the simple gasoline engine, the semi-Diesel, ten automobile engines, an aeroplane engine, and two Diesel engines. All of these engines are arranged for connection to dynamometers, water brake, or prony brake such that determinations of efficiency and economy may be readily made. For the laboratory study of the principles of heating, ventilation, air conditioning, and refrigeration, there is available a fully equipped house heating unit and a refrigeration laboratory. The latter contains both an ammonia compressor and a CO_2 compressor which operated in series make possible a cold room temperature of fifty degrees below zero.

Compressed air, gas, steam, water, and a wide range of electric power are available as nessary throughout the research room and laboratories. As far as possible the units in all laboratories are of the small commercial sizes, such that students may have the advantage of operating them with a minimum of supervision.

SAYRE PARK

A development of the mountain side of the University grounds was effected through the donation to the University in 1909 of the sum of $100,000.00 by the children of the late Robert H. Sayre, to be used in the development of Sayre Park as a memorial to their father, who was a trustee of the University from its foundation in 1866 to his death in 1907.

THE ARBORETUM

The arboretum is a tract of about eleven acres adjoining Sayre Park. It was established by a friend of the University as a tree nursery for the purpose of furnishing illustrative specimens of American trees, and of cultivating trees and shrubs for the beautifying of the park. All of the more important species of North American trees are to be found in the University park and the arboretum. Adjoining the arboretum a tract of seven acres has been planted with a variety of indigenous trees as an exhibition growth of tree culture.

SCHOLARSHIPS

UNIVERSITY SCHOLARSHIPS

The following scholarships are awarded annually:

1. Six free and ten deferred tuition scholarships to freshmen, each of whom has shown that

(a) He is in need of financial assistance;

(b) He attained an average scholastic record which placed him in the highest third of his class in the high school or preparatory school from which he was graduated;

(c) His character and personality are such as to give promise that he will profit by a college education.

2. Eighteen free and thirty deferred tuition scholarships to students above the grade of freshman, each of whom has com-

pleted at least one year's work at the University and has shown that

(a) He is in need of financial assistance;

(b) He secured during the previous academic year an average grade of 2.00 or higher;

(c) His character and personality are such that the University may properly assist him.

3. Thirty-six deferred tuition scholarships to students in any class, subject to the foregoing requirements.

4. Twenty-four deferred tuition scholarships in the award of which prospective school teaching is considered as a factor in addition to the foregoing requirements.

5. Twenty-five deferred tuition scholarships to graduate students.

Interest at the rate of 6% on notes for deferred tuition begins on the day the student is graduated or withdraws from the University.

Deferred tuition notes are payable in monthly installments beginning three months after a student's graduation or withdrawal from the University, at the rate of $15.00 a month during the first year and $20.00 a month thereafter.

In no case is a scholarship awarded for more than one academic year in advance.

Applications for scholarships are considered by the committee on Scholarships and Loans on July first of each year. Applicants for freshman scholarships must submit, prior to July first, records of their academic work and statements concerning their relative class standing from the principals of the schools they have attended.

THE WILBUR SCHOLARSHIP

The Wilbur scholarship, founded in 1872 by the late E. P. Wilbur, provides the sum of $200.00 which is awarded annually to the sophomore with the best record for the sophomore year.

THE HENRY S. HAINES MEMORIAL SCHOLARSHIP

Mrs. Henry S. Haines, of Savannah, Ga., established in 1889 a scholarship of the annual value of $200.00 as a memorial to

her son, Henry Stevens Haines, M.E., '87. By terms of the bequest this scholarship is awarded to a student in the curriculum in Mechanical Engineering. The requirements governing the award of University scholarships apply likewise to this scholarship.

THE FRED. MERCUR MEMORIAL FUND SCHOLARSHIPS

Friends of the late Frederick Mercur, of Wilkes-Barre, Pa., General Manager of the Lehigh Valley Coal Company, desiring to establish a memorial of their friendship and esteem, and to perpetuate his memory, contributed and placed in the hands of the trustees of the University a fund called the Fred. Mercur Memorial Fund. The income from this fund, amounting to $600.00 annually, is awarded to students of the University. The requirements governing the award of University scholarships apply likewise to these scholarships.

THE RAY SANDS NOSTRAND SCHOLARSHIP

The Ray Sands Nostrand scholarship was established by the late Benjamin B. Nostrand, jr., M.E., '78, in memory of his son, Ray Sands Nostrand, '17. The income from this fund, amounting to $500.00 annually, is awarded to students of the University. The requirements governing the award of University scholarships apply likewise to this scholarship.

ENDOWED SCHOLARSHIPS

Undergraduate scholarships named to honor an individual or corporation may be established in perpetuity through the payment to the Board of Trustees of Lehigh University of $10,000.00. The income from this donation will be paid to the holder of the scholarship to be applied towards the payment of University fees. The University does not, however, guarantee that this income will be forever sufficient to pay such fees in full.

FINANCIAL AID

LOANS

A student who gives satisfactory evidence of his inability to pay his expenses may apply for aid from the loan funds of the University. A student to whom a loan is granted gives a note also signed by his parent or guardian, bearing interest at the legal rate from the date of the loan, and payable at some fixed date agreed upon. The granting of à loan is based on a knowledge of the needs of each applicant; the decision in each case is determined by all available information, and such information is treated as confidential.

The committee on Scholarships and Loans must be thoroughly convinced of the student's inability to pay his expenses; if it is found that an application is made as a matter of convenience to avoid the necessity of earnest effort on the part of the applicant or of his parents to obtain the necessary money from relatives or friends or from a bank, the committee will consider such information as ground for the refusal of a loan.

The committee may at any time require from a student to whom a loan is granted a statement of his expenses while at the University. Expenditures above what is necessary for books, instruments, and laboratory fees, and for suitable but inexpensive board and lodging, or the possession of an automobile for use at the University, will be considered as evidence that the student's circumstances are not in accord with his statement that it is impossible for himself or his parents to pay or provide for his expenses.

A loan is granted, as a rule, only to a student who has made a good record in the University. A loan is not ordinarily granted to a student during his first year of attendance.

THE ECKLEY B. COXE MEMORIAL FUND

In memory of the late Eckley B. Coxe, trustee of the University, Mrs. Coxe established a fund, amounting to $65,350.00, the interest of which is used, under the direction of the trustees of the University, and subject to such regulations as they may adopt, for the assistance of worthy students requiring financial aid.

THE FRANK WILLIAMS FUND

Frank Williams, B.S., '87, E.M., '88, who died in October, 1900, bequeathed to the University the greater part of his estate to found a fund, now amounting to $162,000.00, the income of which is lent to deserving students.

THE PRESIDENT'S FUND

The President's Fund was established during the early years of the University for the help of deserving students. As payments are made by former beneficiaries they are immediately available for the assistance of students of the University.

THE FRAZIER AND RINGER MEMORIAL FUND

The Frazier and Ringer Memorial Fund was established in 1906 by the late Robert H. Sayre, in memory of Benjamin West Frazier, A.M., Sc.D., former professor of Mineralogy and Metallurgy, and Severin Ringer, U.J.D., former professor of Modern Languages and Literature and of History, each of whom served Lehigh University for one-third of a century. The income of this fund, which now amounts to $4,534.65, and payments made by former borrowers are available for loans to cover the medical and surgical care of worthy students.

PRIZES

THE WILBUR PRIZES

A fund was established by the late E. P. Wilbur for distribution in prizes as the faculty may determine. This fund yields an annual income of $100.00.

THE JOHN B. CARSON PRIZE

An annual prize of $50.00 was established in 1909 by Mrs. Helen B. Turner, of Philadelphia, Pa., in memory of her father, John B. Carson, whose son, James D. Carson, was a graduate of the Civil Engineering curriculum of Lehigh University in 1876. It is awarded for the best thesis by a senior pursuing the curriculum in Civil Engineering.

THE WILLIAM H. CHANDLER PRIZES IN CHEMISTRY

Four annual prizes of $25.00 each, one in each class, for excellence in the curricula in Chemistry and Chemical Engi-

neering, were established in 1920 by the gift of Mrs. Mary E. Chandler, of Bethlehem, Pa., widow of Dr. Wiliam H. Chandler, who was professor of Chemistry in Lehigh University from 1871 until his death in 1906. In memory of Dr. Chandler the faculty named the prizes the William H. Chandler Prizes in Chemistry.

THE ELECTRICAL ENGINEERING PRIZE

An annual prize of $25.00, established by an anonymous graduate of the curriculum in Electrical Engineering, is awarded to the member of the graduating class presenting the best thesis in Electrical Engineering.

THE PHILIP FRANCIS DU PONT MEMORIAL THESIS PRIZE IN ELECTRICAL ENGINEERING

The Philip Francis duPont memorial thesis prize fund was established in 1929 by L. S. Horner, E.E., '98. The annual income of this fund, $150.00, is awarded each year as two prizes of $100.00 and $50.00 for the best senior theses in electrical engineering. The subject for 1933-1934 is. "Air Conditioning." If in any year, in the opinion of the head of the department of Electrical Engineering, no thesis submitted is worthy of the award, the income of the fund is accumulated and added to the succeeding year's award.

THE HORN PRIZE

The heirs of Harold J. Horn, E.E., '98, established a fund the income of which is used in the award of two prizes of $40.00 and $20.00 for the best work in senior Electrical Engineering Seminar.

ALUMNI PRIZES

By a resolution of the Alumni Association of September 21, 1900, the Alumni Scholarship Fund, which was originally designed to help poor students, was, with the consent of the contributors, diverted from this purpose and the income devoted to prizes to members of the junior class. In 1933 two prizes of $25.00 each were awarded to the first honor men of the curricula in Mechanical Engineering and Metallurgical Engineering. In subsequent years the prizes will be awarded to the first honor men of the technical curricula in turn.

THE WILLIAMS PRIZES IN ENGLISH

Professor Edward H. Williams, jr., an alumnus of the University of the class of 1875, established in 1900 prizes for excellence in English composition and public speaking. The freshman, sophomore, and junior prizes are awarded by the faculty on the recommendation of the department of English.

Freshman Oral Composition Prizes. A first prize of $40.00 and a second prize of $15.00 are awarded to freshmen of regular standing who excel in the oral composition contest held in May of each year.

Sophomore Composition Prizes. A first prize of $50.00, a second prize of $25.00, and a third prize of $15.00, are awarded annually for the three best compositions submitted by sophomores of regular standing as required work in their English courses.

Junior Composition Prizes. A first prize of $40.00 and a second prize of $15.00 are awarded for the two best essays submitted by juniors as part of the required work of their courses in English.

THE WILLIAMS SENIOR PRIZES

The Williams senior prizes are awarded by the faculty on the recommendation of the committee on Williams Senior Prizes.

1. First prizes of $75.00 and second prizes of $25.00 are awarded annually in each of the four fields of Economics, English, Philosophy, and Psychology for dissertations submitted by regular members of the senior class on or before May 1st.

2. The committee on Williams Senior Prizes publishes before the close of the University year a list of recommended subjects for dissertations, but a senior may submit a dissertation upon any other subject in the respective fields if the subject has received the approval of the committee.

3. Each senior entering the competition shall submit to the committee his choice of subject and plan of work by December 1.

4. The awards are made by the faculty upon recommendation of the committee, but no award is made if in any case a dissertation does not meet the standards of merit established

by the committee. This standard includes such points as excellence in thought, plan, development, argument, and composition.

SCHOLARSHIP CUPS

PHI ETA SIGMA CUP. The Phi Eta Sigma honorary freshman awards annually a scholastic cup to the living group whose freshmen (not fewer than five) have made the highest scholastic average for the year.

PHI SIGMA KAPPA SCHOLARSHIP CUP. The Phi Sigma Kappa social fraternity has provided a scholarship cup which is awarded for one year to the fraternity in the Interfraternity Council having the highest scholarship average for the preceding year. The cup becomes the permanent property of the fraternity winning it for three successive years.

TRUSTEES' SCHOLARSHIP CUP. The trustees of the University have provided a scholarship cup which is awarded for one year to the living group having the highest scholarship average for the preceding year. The Trustees' Scholarship Cup becomes the permanent property of any living group winning it for three successive years.

PRIZES AWARDED BY STUDENT ORGANIZATIONS

TAU BETA PI PRIZE. The Tau Beta Pi honorary engineering fraternity awards a slide rule each year to the technical freshman having the highest scholastic average.

ETA SIGMA PHI MEDAL. The Eta Sigma Phi classical fraternity awards a scholastic medal to that student doing the best work in Sophomore Collegiate Latin.

ALPHA KAPPA PSI MEDALLION. The Alpha Kappa Psi professional fraternity in commerce awards a scholastic medallion each year to the highest ranking junior in the College of Business Administration.

PI TAU SIGMA PRIZE. The Pi Tau Sigma honorary fraternity in Mechanical Engineering awards each year a mechanical engineer's handbook for the best record among freshmen enrolling in Mechanical Engineering.

ETA KAPPA NU PRIZE. The Eta Kappa Nu honorary fraternity in Electrical Engineering awards a handbook in electrical engineering to the highest ranking freshman in Electrical Engineering.

American Society of Civil Engineers Junior Membership Prize. The student branch of the American Society of Civil Engineers offers a prize of a junior membership in the American Society of Civil Engineers to the highest ranking senior in Civil Engineering holding membership in the student chapter.

MISCELLANEOUS

GRADUATING THESES

Theses, when required, are accompanied by drawings and diagrams, whenever the subjects need such illustration. The originals are kept by the University, as a part of the student's record, for future reference, but copies may be retained by students, and may be published, permission having first been obtained from the faculty.

PLACEMENT SERVICE

A placement service is maintained with a director in charge. Through it the heads of the various curricula of the University cooperate with business and industry in placing men in suitable positions. This service covers alumni as well as seniors about to graduate. The placement office also serves as a central point of contact for undergraduates and employers interested in student part-time employment.

Teacher placement for those who desire to teach is aided by the Teacher Placement Committee. An important function of this committee is to work in cooperation with the Teacher Bureau of the Department of Public Instruction of Pennsylvania at Harrisburg.

STUDENTS' HEALTH SERVICE

The Students' Health Service, organized in 1923, has general charge of all health and sanitary measures in the University. The work of the department is organized under four heads: sanitation, physical examinations, dispensary service, education.

Sanitation. The director of the Health Service is in direct charge of the sanitation of University buildings and grounds, and exercises such supervision as is possible over other accommodations for students.

Physical Examinations. Each student is required to undergo a complete physical examination each year. This examination, which is made jointly by the Health Service and the department of Physical Education, serves the needs of both these departments and also complies with the requirements of the Reserve Officers' Training Corps. All physical defects and departures from normal are noted, and the students are divided into groups as follows: (1) those who present no abnormalities and who can proceed with the regular mental and physical work of the University, (2) those who are abnormal or subnormal, but who should be brought up to normal by the regular courses in physical education, (3) those who require special or corrective treatment.

Students who fall into groups 2 and 3 are observed at regular intervals, and every effort is made to bring them up to the highest degree of physical development and health. Individual records are kept of the progress of each case.

Dispensary Service. The Health Service maintains a dispensary in Saucon Hall where students may receive free treatment for minor illnesses and injuries. The dispensary hours are from 8.30 a.m. to 12.00 m. on all week days, from 1.30 to 5.00 p.m. on week days except Saturday, and from 10.00 a.m. to 12.00 m. on Sunday. A physician and a nurse are on duty in the dispensary during these hours. While the Health Service does not furnish medical attendance to students who are sick in their rooms, the director keeps in touch with such cases by telephone and otherwise in so far as is possible in order to see that the students are receiving proper attention and that the time lost from University work is minimized. It is requested that all such cases, together with the names of the attending physicians, be reported to the director in order that complete records of the health of the students may be kept.

Education. A course in Personal and Social Hygiene is given to freshmen by the director of the Health Service in conjunction with the departments of Biology and Physical Education. In this course emphasis is laid on those points of personal hygiene most applicable to the student recently deprived of the atmosphere and influences of home. In social hygiene an effort is made to disseminate correct information

concerning the history and present status of social diseases and the effectiveness of approved methods for the relief of existing conditions. This phase of the Health Service constitutes a specific part of the general program of instruction recommended by the State Board of Health and by other recognized organizations for the promotion of social hygiene.

HONORARY SCHOLARSHIP SOCIETIES

PHI BETA KAPPA. Students in the College of Arts and Science and the College of Business Administration who up to the middle of the senior year maintain high scholarship may be elected to membership; also a limited number of engineering students whose work in philosophical, scientific, and language studies is of high grade.

TAU BETA PI. This national honorary society, which now has forty-one chapters, was founded at Lehigh University in 1885, by Professor E. H. Williams, jr. Students in the College of Engineering who up to the middle of the junior year maintain high scholarship may be elected to membership.

SIGMA XI. Election to membership is based upon the completion of original and noteworthy research in pure or applied science and the publication of the results thereof. Ordinarily undergraduates are eligible to associate membership only, their election being based upon their promise of achievement in scientific research.

Other Scholastic Honorary Societies

ETA KAPPA NU (electrical engineering)
ETA SIGMA PHI (classics)
PHI ETA SIGMA (freshman)
PI MU EPSILON (mathematics)
PI TAU SIGMA (mechanical engineering)
ROBERT W. BLAKE SOCIETY (philosophy)

COURSE SOCIETIES

Intellectual interest in various fields of study and professional spirit among pre-medical, pre-legal, business, and engineering students are promoted by a group of organizations commonly called course societies. The first of these organizations historically was the Chemical Society, established in 1871. The list now includes:

In Arts and Science

Delta Omicron Theta (public speaking)
International Relations Club (history and government)
Newtonian Society (mathematics)
Pre-Legal Society
Robert W. Hall Pre-Medical Society

In Business Administration

Alpha Kappa Psi (professional fraternity in commerce)

In Engineering

Chemical Society
Student Chapter of the American Society of Civil Engineers
Electrical Engineering Society (student branch of the American Institute of Electrical Engineers)
Industrial Engineering Society
Mechanical Engineering Society (student branch of the American Society of Mechanical Engineers)
Metallurgical Society
Mining and Geological Society (student branch of the American Institute of Mining and Metallurgical Engineers)
Physics Club
Radio Club

OTHER ORGANIZATIONS

Other student organizations include:
Arcadia (student self-government council)
Brown Key Society
Cyanide Club (junior honorary society)
Fencing Club
Interfraternity Council
L Club
Lehigh Band
Lehigh Union (general students' social organization)
Musical Clubs, Combined
Mustard and Cheese (dramatic club)
Omicron Delta Kappa (senior honorary fraternity)
Pi Delta Epsilon (honorary journalistic fraternity)
Rifle Club
Scabbard and Blade (honorary military fraternity)
Spiked Shoe (honorary fraternity, track athletics)

The following Greek letter fraternities have chapters at Lehigh University: Alpha Chi Rho, Alpha Kappa Pi, Alpha Tau Omega, Beta Theta Pi, Chi Phi, Chi Psi, Delta Phi, Delta Sigma Phi, Delta Tau Delta, Delta Upsilon, Kappa Alpha, Kappa Sigma, Lambda Chi Alpha, Omega Phi Sigma (local), Phi Delta Theta, Phi Gamma Delta, Phi Sigma Kappa, Pi Kappa Alpha, Pi Lambda Phi, Psi Upsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi, Sigma Phi Epsilon, Tau Delta Phi, Theta Delta Chi, Theta Kappa Phi, Theta Xi.

STUDENT PUBLICATIONS

The students of Lehigh University publish a semi-weekly college newspaper, *The Lehigh Brown and White;* a quarterly magazine, *The Lehigh Review;* a comic monthly, *The Lehigh Burr;* and a year book, *The Epitome.*

FOUNDER'S DAY

The second Wednesday following the opening of the University in each year is celebrated as Founder's Day in honor of the Founder of the University, Asa Packer. Degrees are conferred and freshmen and sophomore honors and prizes are announced.

At the exercises on October 4, 1933, the fifty-fourth Founder's Day, an address entitled "Thoughts of a Biologist on Education" was delivered by Hans Zinsser, A.M., M.D., D.Sc., Professor of Bacteriology and Immunology in the Harvard University Medical School.

UNIVERSITY SUNDAY

The Sunday preceding University Day is known as University Sunday, and is devoted to the baccalaureate service. The baccalaureate sermon on June 11, 1933, was preached by the Rev. Claude G. Beardslee, B.A., B.D., M.A., S.T.M., Ph.D., Chaplain of the University.

UNIVERSITY DAY

University Day marks the close of the academic year. On this day the graduation exercises are held, an address is given; senior honors and prizes are announced, and degrees are conferred. The address at the exercises on June 13, 1933, was given by Mark Sullivan, A.B., LL.B., Litt.D., of Washington, D. C. Commissions in the Officers' Reserve Corps were awarded

by Major James Oscar Green, Jr., Professor of Military Science and Tactics.

ALUMNI ASSOCIATION

The Alumni Association, which has been in existence since 1876, was incorporated in 1917 under the name the Alumni Association of the Lehigh University, Inc. The offices of the Association are in the Alumni Memorial Building. The Secretary, who is a permanent officer, edits the *Lehigh Alumni Bulletin*, a news publication issued monthly from October to July, inclusive, and the *Directory of Alumni and Students.* The Association is largely concerned with raising money to meet the needs of the University.

The officers and directors of the Alumni Association for 1933-1934 are:

President, Robert Farnham, '99, of Philadelphia, Pa.
Vice-President, E. A. Quier, '91, of Reading, Pa.
Vice-President, N. M. Merriman, '05, of New York, N.Y.
Treasurer, R. S. Taylor, '95, of Bethlehem, Pa.
Secretary, A. E. Buchanan, jr., '18, of Bethlehem, Pa.
Archivist, R. P. More, '10, Bethlehem, Pa.

The following are the local alumni clubs: New York Lehigh Club, Philadelphia Lehigh Club, Pittsburgh Lehigh Club, Chicago Lehigh Club, Washington Lehigh Club, Detroit Lehigh Club, Cincinnati Lehigh Club, Toledo (Ohio) Lehigh Club, Northeastern Pennsylvania Lehigh Club (Scranton and Wilkes-Barre, Pa.), Maryland Lehigh Club (Baltimore, Md.), Lehigh Club of New England (Boston, Mass.), Lehigh Club of Central Pennsylvania (Harrisburg, Pa.), Lehigh Club of Northern New York (Schenectady, N. Y.), Lehigh Club of Northern Ohio (Cleveland, O.), Lehigh Club of Southern New England (Hartford, Conn.), Lehigh Club of Western New York (Buffalo, N. Y.), Southern Anthracite Lehigh Club (Pottsville, Pa.), Lehigh Home Club (Bethlehem, Pa.), Lehigh Club of China (Wuchang, China), Lehigh Club of Cuba (Havana, Cuba), Lehigh Club of Southeastern Pennsylvania (Reading, Pa.), Lehigh Club of Trenton (N.J.), Lehigh Club of York (Pa.), Lehigh Club of Northern New Jersey (Newark), Lehigh Club of Northern California (San Francisco), Lehigh Club of Southern California (Los Angeles).

DEGREES

Conferred on University Day, June 13, 1933

HONORARY DEGREES

DOCTOR OF ENGINEERING

David Garrett Kerr — Pittsburgh
Frank Anderson Merrick — East Pittsburgh

DOCTOR OF HUMANE LETTERS

James Truslow Adams — Washington, D.C.

DOCTOR OF LAWS

Frank William Sterrett — Bethlehem

PROFESSIONAL DEGREES

ENGINEER OF MINES

Joseph Daniels, S.B., M.S. — Seattle, Wash.
(Massachusetts Institute of Technology, Lehigh University)

MECHANICAL ENGINEER

Joseph Coblentz Groff, N.E. — Allentown
(Lehigh University)

DEGREES IN COURSE

MASTER OF ARTS

Major in Bacteriology

James Wendell Burger, A.B. — Lebanon
(Haverford College)

Major in Education

Roland Franklin Hartman, B.S., Ph.B. — Allentown
(Lehigh University, Muhlenberg College)
Joseph Ellis Laury, B.A. — Bethlehem
(Muhlenberg College)
Michael Joseph Ryan, Jr., B.A. — Bethlehem
(Lehigh University)
Russell Lloyd Thierolf, B.S. — Bethlehem
(Lafayette College)

Major in History

Stanley Stephen Beers, B.S. — Allentown
(Temple University)

Major in Latin

Elwood Lesher Ortt, B.A. — Emaus
(Muhlenberg College)
Anna May Todd, B.A. — Bethlehem
(Moravian College for Women)

MASTER OF SCIENCE

Major in Bacteriology

William Asa Green, B.S. *(Moravian College)*	Bethlehem
Edgar Francis Lillicrapp, B.S. *(Lafayette College)*	Easton

Major in Chemical Engineering

Elmer Benjamin Cyphers, B.S. in Ch.E. *(Lehigh University)*	Bethlehem
Lester Eugene Day, B.S. in Chem. *(Johns Hopkins University)*	Lyons, N.J.
John Mathewson Graham, B.S. in Ch.E. *(Pennsylvania State College)*	Allentown
Charles Edward Lieberman, B.S. *(Georgetown University)*	Allentown
William Coventry Waddell Smith, B.S. *(Princeton University)*	Princeton, N.J.

Major in Chemistry

Alton Richard Beall, B.A. *(University of Cincinnati)*	Williamsport, O.
George Ellsworth Cooper, B.S. in Ch.E. *(Lehigh University)*	Coopersburg
Samuel Wroath Farrell, B.S. in Ch.E. *(Case School of Applied Science)*	Cleveland, O.
Charles August Jeanson, III, B.S. in Ch.E. *(Lehigh University)*	Brooklyn, N.Y.
Ernst Jacob Klinger, B.S. *(University of Nebraska)*	Hanover, Kans.
John Adam Lutz, Jr., Ch.E. *(Lehigh University)*	Myerstown
Joseph Napravnik, B.S. in Ch.E. *(Lehigh University)*	Freemansburg

Major in Civil Engineering

Howard Johnson Godfrey, B.S. in C.E. *(Tufts College)*	Needham, Mass.

Major in Electrical Engineering

Stanley Clinton Diehl, B.S. in E.E. *(Lehigh University)*	Allentown
Elmer Charles Easton, B.S. in E.E. *(Lehigh University)*	Newark, N.J.
Roy Kogge, A.A., B.S. in E.E. *(Lewis Institute)*	Chicago, Ill.
Frank Bernard Lucas, B.S. in E.E. *(Purdue University)*	Lafayette, Ind.
Edward Haring Weiss, B.S. in E.E. *(Lehigh University)*	Allentown

Major in Mathematics

John Edwin Freehafer, B.S. in Eng. Phys. *(Lehigh University)*	Reading
Joseph Edward Illick, C.E. *(Lehigh University)*	Bethlehem

Major in Mechanical Engineering

James Francis Houser, B.S. in M.E. *(University of Pittsburgh)*	Lebanon
George Boyer Kadel, B.S. in M.E. *(Lehigh University)*	Baltimore, Md.
Henry Louis Langhaar, B.S. in M.E. *(Lehigh University)*	Allentown
David Perry Nichols, B.S. in I.E. *(Lehigh University)*	Pennington, N.J.
Francis Patrick Shannon, B.S., B.S. in M.E. *(Canisius College, Lehigh University)*	Buffalo, N.Y.

Major in Metallurgy

Carl Louis Bittrich, Met.E. *(Lehigh University)*	Bethlehem
Arthur Joseph Ciastkewicz, B.S. in E.M. *(Lehigh University)*	New York, N.Y.

Major in Physics

Albert Paddock Crary, B.S. *(St. Lawrence University)*	Canton, N.Y.
Edward Braislin Douglas, B.S. in Eng. Phys. *(Lehigh University)*	Plainfield, N.J.
Harry Charles Kelly, B.S. in Eng.Phys. *(Lehigh University)*	Wilkes-Barre

BACHELOR OF ARTS

Moses Abrahams	Brooklyn, N.Y.
James Evans Anderson	Tottenville, N.Y.
Maurice Bauman	New York, N.Y.
Frank Bene	Bethlehem
Arthur Leonard Benson	Easton, Md.
Gerald Alan Bernstein	New York, N.Y.
Maurice Bernstein	East Orange, N.J.
Frank Biro. Jr.	Bethlehem
William Edwin Bray	Freeland
William Alfred Burhouse	Drexel Park
Russell Williams Burk	Newark, N.J.
Joseph Capozzola	Pen Argyl
Clarendon Nelson Crichton	Johnstown
Gaylord Hill Day	Lyons, N.J.
John Patterson Dean	Morristown, N.J.

Bertram A. Druckerman	Brooklyn, N.Y.
David Dave Fischer	Long Branch, N.J.
Edward Fleischer	Bethlehem
John William Frace	Easton
Milton Jay Friedman	Brooklyn, N.Y.
John Herbert Fulweiler	Wallingford
Elmer William Glick	Bethlehem
Lester Charles Gold	Bethlehem
Abraham Edward Grudin	Hillside, N.J.
Probert Edwards Herb	Luzerne
Herbert Aaron Jerauld	Attleboro, Mass.
Daniel John Layton	Georgetown, Del.
Sol David Liebowitt	Long Branch, N.J.
Sidney David Levinson	Bradley Beach, N.J.
George Lewis	New York, N.Y.
Jerome Philip Lewis	East Orange, N.J.
Monroe Samuel Lewis	Newark, N.J.
Henry Nathan Miller	Bethlehem
Benjamin Minifie	Belleville, N.J.
Martin Monroe Reed, Jr.	Philadelphia
William Henry Roeber	Irvington, N.J.
James Jackson Roessle	Pittsburgh
Nathaniel Shomer Rothenberg	New York, N.Y.
Karl Roy Schneck	Allentown
Arthur Schwartz	New York, N.Y.
David Gregg Shipley	Hoboken, N.J.
Joseph Kauffman Strawbridge	Rome, N.Y.
James Alvin Tempest	Catasauqua
Alex Edward Weiner	Brooklyn, N.Y.

BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION

John Alan Aufhammer	Pittsburgh
Robert Ruch Bachman	Drexel Hill
William Perry Baker	New Rochelle, N.Y.
Charles Albert Bennett	White Plains, N.Y.
Francis Wolle Peter Boquel	Bethlehem
Jesse Bayliss Bronstein, Jr., B.S. in Ch.E. *(Lehigh University)*	Allentown
Joseph Theodore Clauss	Brooklyn, N.Y.
William Cohn	New York, N.Y.
William Burrill Crouse	Philadelphia
Frank Elmer Delano	Glen Ridge, N.J.
James Cummins Diefenbach	Westfield, N.J.
Jack Creighton Dinkel	Buffalo, N.Y.
Langdon Cheves Dow	Wilkes-Barre
Louis J. Engelman	Yonkers, N.Y.
Franklin Spangler Eyster	York
James Hopkins Fountain	Easton, Md.
Harry John Gerth	Rockville Center, N.Y.

Arthur Jack Gold	Trenton, N.J.
Edward Clark Graham	Newburgh, N.Y.
Samuel Thomas Harleman, Jr.	Bethlehem
Richard Samuel Hess	Bethlehem
Harold Hirshberg	Long Beach, N.Y.
William Bergen Holcombe	Hopewell, N.J.
Woodrow Washington Horn	Bangor
Warren Sidney Jampol	New Rochelle, N.Y.
Frederick Davidson Keck	Aspinwall
Wilson Stephen Kistler	Stroudsburg
Franklin Adee Kolyer	Summit, N.J.
Warren Hillory Kresge	Bethlehem
William Romeyn Lathrop, Jr.	Birmingham, Ala.
Albert Filbert Linguiti	Brooklyn, N.Y.
Alfred Joseph Lipsky	Troy, N.Y.
Nicholas Peregrine Lloyd, Jr.	Philadelphia
Robert Henry Lutzy	Cleveland Heights, O.
John Stanley McElwain	Sewickley
John Edwin Miller	Bethlehem
William Wirt Mills, Jr.	Staten Island, N.Y.
Grable Harry Mitchell	Washington, D.C.
Robert Vincent Morgan	Bethlehem
Samuel Joseph Newman	Nutley, N.J.
Robert Lee O'Brien, Jr.	Washington, D.C.
Richard Holden Olney	Lowell, Mass.
Clarence Bardwell Peck, Jr.	Charleston, W.Va.
Donald Charles Pierce	Paterson, N.J.
William Townley Potter	Elizabeth, N.J.
William Taylor Rhoades	Washington, D.C.
Burt Henry Riviere	Pittsburgh
Alexander Duffield Robb, Jr.	Toronto, Can.
Edward Haupt Robb	Toronto, Can.
James Kenneth Ryan	Schenectady, N.Y.
Sanford Schwartz	New York, N.Y.
Harold Irving Silver	Hudson, N.Y.
Milton Silverstein	Brooklyn, N.Y.
Ivor Donald Sims	Bethlehem
Page Harrison Slaughter, Jr.	East Aurora, N.Y.
Felix Marcus Sommer	Newark, N.J.
Morton David Spector	Philadelphia
Roy Arnold Sykes	Paterson, N.J.
John Rockwell Taft	Maplewood, N.J.
Herbert Milton Tiefenthal	New York, N.Y.
Charles Adam VanBilliard	Bethlehem
Albert Newton VanDeusen	East Orange, N.J.
*Henry Alfred Voss	Brooklyn, N.Y.
Harry Warendorf, II	Hollis, N.Y.
William Bradford Warren	Westfield, Mass.
Charles Yaffe	Reading

* Diploma withheld pending completion of R. O. T. C. Camp.

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

Aaron Samuel Berlin	Wilmington, Del.
Robert Carl Braun	Reading
Lowry Scattergood Danser	Yardley
Russell Tattershall Dean	Bethlehem
Lemoyne Eugene Decker	Harrisburg
George Malcolm Dewees	West Chester
David Mathias Ebert	Wilmington, Del.
Karl Albert Fisher	Kutztown
Ralph Horace Frederick	East Greenville
John Franklin Garber	Lumberville
Orlando Graziani	Forli, Italy
Charles Marcellus Jackson	Philadelphia
Ernest Frederick Jenny	Dumont, N.J.
Walter Harvey Kelley, Jr.	Bethlehem
John Joseph McGovern	Bethlehem
Fred Lewis Rights	Bethlehem
Richard Huber Rouse, Sc.B. *(Dickinson College)*	Camp Hill
Earl James Serfass	Allentown
John Scott Skelly, Jr.	Monongahela
Axel Tage-Nielsen, Jr.	Elizabeth, N.J.
Robert Scott Taylor	Pottsville
William John Taylor, Jr.	Pottsville
David Waldemar Winkler	Bethlehem

BACHELOR OF SCIENCE IN CHEMISTRY

Andres Carrillo	Habana, Cuba
John Randolph Ellstrom	Bethlehem
James William Fehnel	Richmond Hill, N.Y.
George Swan Hagstoz	Riverton, N.J.
John Edwin Hall	Bethlehem
Clifford Earl Harrison. Jr.	Philadelphia
John Henry Hart, Jr.	Bethlehem
Milton Walter Kahn	Stamford, Conn.
Samuel Randall Kulp, Jr.	Bethlehem
Xavier Vincent Laporta	Weedville
Atwood Jester Ricards	Marshallton, Del.

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

John James Antoniotti	Union City, N.J.
James McKim Bell, Jr.	Rio de Janeiro, Brazil
Lewis Cunningham Byers	Catonsville, Md.
Harrison Durgin Comins	Vineland, N.J.
Pierce John Flanigan, Jr.	Baltimore, Md.
Robert Heil Garrett	Frackville
Wilbur Mercer Gibbs	Trenton, N.J.
Alexander Amedé Hans	Locust Valley, N.Y.
Jack Henry Kaufman	Wilmette, Ill.

Robert Green Kugler	East Orange, N.J.
John Noble Marshall	Bethlehem
Thomas Warwick Newcomb	Long Branch, N.J.
John Sherman Sawyer	Bethlehem
Anthony Joseph Saxe	Baltimore, Md.
William Henry Simcoe	Trenton, N.J.
Albert Paulding Thomas	Flushing, N.Y.
Charles Emerson Tomb	Coopersburg
Morris Bordner Uhrich	Myerstown
Harold Benedict Zabriskie	Hackensack, N.J.

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Robert Ethan Bangsberg	LaCrosse, Wis.
*Benjamin DeWitt Beach	Montrose
Charles William Cooper	Sewickley
Walter Wiest Felton	Columbia
John Raymond Fritz	Reading
Evan Henry Guyer	Buffalo, N.Y.
William DeForest Hickman	Arlington, N.J.
Ellwood Royal Lanahan	Philadelphia
Sidney Land	Brooklyn, N.Y.
Robert Peary Lee	Meriden, Conn.
Vance Fager Rigling	New Cumberland
Arthur Samuel Widdowfield	Scranton
James Frederic Willenbecher	Allentown
William Edgar Withrow	Manasquan, N.J.
William Cope Young	East Orange, N.J.

* Diploma withheld pending completion of R. O. T. C. Camp.

BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

Howard Frederick Carl	Washington, D.C.
Melvin Dresher	Hackensack, N.J.
John Mueller Lohse	Glen Ridge, N.J.
Robert Julius Myers	Elkins Park

BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

Richard Allen Andrews	Salt Lake City, Utah
Fosdick Whitney Ayer	Plainfield, N.J.
Allan Ayers, Jr.	Cranford, N.J.
Walter Crawford Bachman	Nazareth
Oakford Chandler Bailey	Pennsville, N.J.
William Christian Buchanan	Philadelphia
Charles Campbell, Jr.	Fullerton
Richard Wilbur Claypoole	Freeport
Malcolm Everett Cooper	Paterson, N.J.
Frederick Noel Cunningham	Bethlehem
Robert Lincoln Davis	Norfolk, Va.
Robert Meyer Dengler	Shenandoah
George Pryor Enke, Jr.	East Orange, N.J.

Thomas William Frutiger	Red Lion
John Williamson Langhaar	Allentown
Theodor Wallace Mommers	Baltimore, Md.
John Perry Nichols	Pennington, N.J.
Raymond Martin Niehaus	East Orange, N.J.
Robert Alexander Nisbet	Pittsburgh
Edmund Howe Poggi, Jr.	Wilkes-Barre
George Douglas Reed	Baltimore, Md.
Henry Conrad Scheer, Jr.	Glen Ridge, N.J.
John William Shelhart	Cleveland, O.
Frank Lichty Snavely	Lancaster
William Lindsay Towers	South Orange, N.J.
Frank John vanHorn	Scranton
Edward William Voit	Warren, O.
Harry Samuel Walker	West Chester
Robert Bates Wall	Chattanooga, Tenn.
Edwin Reinhold Wisner	Sewickley
Robert Nixon Youngblood	Wilkes-Barre

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

Jerome Barney	Wilkes-Barre
Kennard Fleming Borden	Collingswood, N.J.
Edwin Merritt Coe	Suffern, N.Y.
Donald Herbert Freiday	East Orange, N.J.
Walter Clayton French	Philadelphia
Willis Mark Henricks	Pottstown
Victor Beardsley Hertslet	Rowayton, Conn.
Wilbur Lawrence Jurden	New York, N.Y.
George Henry Keller	York
Charles Ward Kellstedt	Gaylordsville, Conn.
Robert Krauss Knipe	Philadelphia
Robert Prince Landis	Old Greenwich, Conn.
Richard Aspril Lodge	Philadelphia
James Crisman Rhoads	Harrisburg
William Eugene Somers	Poland, O.
Norman Judd Tuttle	Wilkes-Barre
John Geyer Williams	Bethlehem
Richard Lewis Willis	Harrisburg

BACHELOR OF SCIENCE IN METALLURGICAL ENGINEERING

Ardrey Middleton Bounds	Philadelphia
Charles Dickey Coxe	Uniontown
Ralph Norris Fitzpatrick	Philadelphia
John Mercer Hazen	Bethlehem
Rudolph Henry Hertzog	Bethlehem
Eugene William Laschober, Jr.	Belvidere, N.J.
Edwin Thomas Legge	Bound Brook, N.J.

Herman Alexander Moorhead	Cleveland Heights, O.
Robert Roth Phillips	Pittsburgh
Henry John Robar	Bethlehem
John Sharpless Worth, A.B. *(Swarthmore College)*	Bethlehem

BACHELOR OF SCIENCE IN MINING ENGINEERING

Robert Putnam Boyd	Staten Island, N.Y.
Stephen Canonico	Red Bank, N.J.
Charles Frederick Lehr	Stockertown
Edward McKechnie	Bethlehem
Edwin William Seiler	Maplewood, N.J.

COMMISSIONS AS SECOND LIEUTENANTS IN THE OFFICERS' RESERVE CORPS

Members of the Graduating Class

Infantry

John Alan Aufhammer	Pittsburgh
William Perry Baker	New Rochelle, N.Y.
Robert Lincoln Davis	Norfolk, Va.
Ralph Norris Fitzpatrick	Philadelphia
Pierce John Flanigan, Jr.	Baltimore, Md.
Donald Herbert Freiday	East Orange, N.J.
Frederick Davidson Keck	Aspinwall
Wilson Stephen Kistler	Stroudsburg
Raymond Martin Niehaus	East Orange, N.J.
Alexander Duffield Robb, Jr.	Toronto, Can.
Charles Adam VanBilliard	Bethlehem
Robert Bates Wall	Chattanooga, Tenn.

Ordnance

Robert Ethan Bangsberg	LaCrosse, Wis.
John Mercer Hazen	Bethlehem
Ernest Frederick Jenny	Dumont, N.J.
Richard Aspril Lodge	Philadelphia
Frank Lichty Snavely	Lancaster
Richard Lewis Willis	Harrisburg

Undergraduates

Infantry

Robert Shelly Porter	East Northfield, Mass.

Ordnance

Rickard Nicholas Laftman	Bayonne, N.J.
William Henry Clothier Webster	Philadelphia

CERTIFICATES OF ELIGIBILITY FOR COMMISSIONS AS SECOND LIEUTENANT IN THE OFFICERS' RESERVE CORPS

(Commissions withheld because of the candidates being under age)

Members of the Graduating Class

Infantry

Russell Tattershall Dean	Bethlehem
Edward Haupt Robb	Toronto, Can.

Ordnance

James Crisman Rhoads	Harrisburg

Undergraduates

Infantry

Edward Maurice Eddleman	Philadelphia
Thomas Benjamin Jordan	South Orange, N.J.

Conferred on Founder's Day, October 4, 1933

HONORARY DEGREES

DOCTOR OF ENGINEERING

Joseph Becker	Pittsburgh
Edwin Jay Prindle	New York, N.Y.

DOCTOR OF SCIENCE

Hans Zinsser	Cambridge, Mass.

DEGREES IN COURSE

MASTER OF ARTS

Major in Education

Donald Bonney Keat, B.S. — Bangor
(Lafayette College)
Henry Denton Kreibel, Ph.B. — New Tripoli
(Muhlenberg College)

Major in English

Robert Howard Deily, A.B., B.S. — Bethlehem
(Muhlenberg College, Columbia University)

Major in History

David Alfred Kern, A.B. — Slatington
(Ursinus College)
Esta Eleanor Metzger, Ph.B. — Allentown
(Muhlenberg College)

Major in Mathematics

Walter Barton Coleman, A.B. — New York, N.Y.
(Swarthmore College)

MASTER OF SCIENCE

Major in Electrical Engineering

Anthony O. J. Danello, B.S. in E.E. *(Ohio University)*	Jersey Shore

BACHELOR OF ARTS

Donald Herbert Anderson	Pittsburgh
George Smith Bowden	Nutley, N.J.
Saul Allen Cohen	Lewistown
James Anthony Fritts	Phillipsburg, N.J.
William Rush Merriam	Washington, D.C.
Nathan Miller	Bethlehem
Marvin Charles Moffett	Coatesville
Maurice Herbert Munzer	New York, N.Y.
Gordon Graves New	Washington, D.C.

BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION

Jay Lewis Alexander	Pittston
Anthony Fotis Anamisakis	Bethlehem
Charles Campbell, Jr.	Pittsburgh
Charles Derrico	New York, N.Y.
Eric Conrad Gustav Kremer	Paterson, N.J.
John Leonard Parsons	Troy
Philip Adams Rorty, Jr.	Goshen, N.Y.
Morris Oscar Strausberg	Brooklyn, N.Y.
Leonard Robert Titelman	Philadelphia

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

Henry Merritt Chapin	Flushing, N.Y.
Robert George Weldon	Mount Vernon, N.Y.

BACHELOR OF SCIENCE IN CHEMISTRY

George Eugene Mathews, Jr.	Norwalk, Conn.
Richard Karl Ruch	Allentown

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Vincent Anthony DeBerardinis	Chester

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Walter Earl Emery	Mount Bethel
Gerald Emanuel Mintz	Allentown

BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

William Henry Charles, Jr.	Riverside, Ill.

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

William Connery Aucott	Philadelphia
William Franklin Cook	Sylvan
Rickard Nicholas Laftman	Bayonne, N.J.
John Armon Lloyd	Wilkes-Barre
Hugh Milner McConahey	Wilkinsburg
Chatwin Ambrose Scharfenberg	East Rockaway, N.Y.

BACHELOR OF SCIENCE IN METALLURGICAL ENGINEERING

Jess Fellows Clarke	Allentown
Orum Roehrer Kerst	Jersey City, N.J.

BACHELOR OF SCIENCE IN MINING ENGINEERING

Richard Randolph Branda	Hamilton, Ont., Canada
Hibberd Reese Crispen	Harrisburg
Harold Henry Pentz	Bethlehem

HONORS AND PRIZES

Announced on University Day, June 13, 1933

Graduation Honors

Graduated with Highest Honors

George Henry Keller	York

Graduated with High Honors

Frank Biro, Jr.	Bethlehem
Elmer William Glick	Bethlehem
John Williamson Langhaar	Allentown
Benjamin Minifie	Belleville, N.J.
Edmund Howe Poggi, Jr.	Wilkes-Barre
James Crisman Rhoads	Harrisburg
Robert Scott Taylor	Pottsville
Morris Bordner Uhrich	Myerstown
Richard Lewis Willis	Harrisburg

Graduated with Honors

Moses Abrahams	Brooklyn, N.Y.
James Evans Anderson	Tottenville, N.Y.
Walter Crawford Bachman	Nazareth
Benjamin DeWitt Beach	Montrose
Charles Albert Bennett	White Plains, N.Y.
Maurice Bernstein	East Orange, N.J.
Charles Dickey Coxe	Uniontown
Russell Tattershall Dean	Bethlehem
George Malcolm Dewees	West Chester
Melvin Dresher	Hackensack, N.J.
Walter Wiest Felton	Columbia
Pierce John Flanigan, Jr.	Baltimore, Md.
James Hopkins Fountain	Easton, Md.
Ralph Horace Frederick	East Greenville
Orlando Graziani	Forli, Italy
Abraham Edward Grudin	Hillside, N.J.
Richard Samuel Hess	Bethlehem
William DeForest Hickman	Arlington, N.J.
Charles Marcellus Jackson	Philadelphia

Herbert Aaron Jerould	Attleboro, Mass.
Eugene William Laschober, Jr.	Belvidere, N.J.
Sol David Leibowitt	Long Branch, N.J.
Monroe Samuel Lewis	Newark, N.J.
Robert Julius Myers	Elkins Park
John Perry Nichols	Pennington, N.J.
Earl James Serfass	Allentown
William Eugene Somers	Poland, O.
Joseph Kauffman Strawbridge	Rome, N.Y.
William John Taylor, Jr.	Pottsville
James Alvin Tempest	Catasauqua
Harry Samuel Walker	West Chester
Robert Bates Wall	Chattanooga, Tenn.
William Bradford Warren	Westfield, Mass.
James Frederic Willenbecher	Allentown
John Geyer Williams	Bethlehem

Graduated with Special Honors

Economics

Moses Abrahams	Brooklyn, N.Y.
Maurice Bernstein	East Orange, N.J.
Elmer William Glick	Bethlehem

Government

James Evans Anderson	Tottenville, N.Y.

Mathematics

Melvin Dresher	Hackensack, N.J.
John Williamson Langhaar	Allentown
Robert Julius Myers	Elkins Park

Psychology

Abraham Edward Grudin	Hillside, N.J.

Honor Graduates in the Reserve Officers' Training Corps

Infantry

Charles Adam Van Billiard	Bethlehem

Ordnance

James Crisman Rhoads	Harrisburg

Prizes

Williams Senior Prizes in Economics

First Prize, $75

Moses Abrahams	Brooklyn, N.Y.

Second Prize, $25

Maurice Bernstein	East Orange, N.J.

Williams Senior Prizes in Philosophy

Second Prize, $25

Milton Jay Friedman	Brooklyn, N.Y.

WILLIAMS SENIOR PRIZES IN PSYCHOLOGY

Second Prizes, $25 each

Frank Bene	Bethlehem
Abraham Edward Grudin	Hillside, N.J.

WILLIAM H. CHANDLER PRIZE, $25—to the highest ranking senior the curricula in Chemistry and Chemical Engineering

Robert Scott Taylor	Pottsville

ELECTRICAL ENGINEERING PRIZE, $25—for the best Electrical Engineering thesis

James Frederic Willenbecher	Allentown

PHILIP FRANCIS DUPONT MEMORIAL THESIS PRIZES IN ELECTRICAL ENGINEERING

First Prize, $100

Benjamin DeWitt Beach	Montrose

Second Prize, $50

Walter Wiest Felton	Columbia

HAROLD J. HORN SENIOR PRIZES IN ELECTRICAL ENGINEERING SEMINAR

First Prize, $40

Vance Fager Rigling	New Cumberland

Second Prize, $20

Robert Peary Lee	Meriden, Conn.

METALLURGICAL ENGINEERING SENIOR PRIZE, $50

Charles Dickey Coxe	Uniontown

AMERICAN SOCIETY OF CIVIL ENGINEERS JUNIOR MEMBERSHIP PRIZE

Morris Bordner Uhrich	Myerstown

Announced on Founder's Day, October 4, 1933

Graduation Honors

GRADUATED WITH HONORS

William Franklin Cook	Sylvan

Freshman and Sophomore Honors, 1932-1933

(Awarded to those members of the classes of 1935 and 1936 who made an average grade of B or higher during the scholastic year 1932-1933.)

FRESHMAN HONORS

John Parker Butterfield	Eng.	Bethlehem
Weston Carrier Cook	Arts	Allentown
Robert Mills Eichner	Eng.	Upper Montclair, N.J.
Walter Leonard Finlay	Eng.	Brooklyn, N.Y.
Walter Richard Guyer	Eng.	Allentown

Carl Franklin Hensinger	Arts	Allentown
David Willard Hoppock	Eng.	Maplewood, N.J.
George Herbert Kalb	Eng.	Altoona
Leonard Michael Lake	Bus.	Mount Vernon, N.Y.
Manuel DePerez Lorenzo	Arts	Bethlehem
Frank Rodeback Millalieu, Jr.	Eng.	Oxford
Edgar Bell Mancke	Eng.	Bethlehem
Peter Masiko, Jr.	Arts	Allentown
John William Mathers	Eng.	Brookline
Paul Ebler Neiman	Eng.	Philadelphia
David Hunt Paul	Arts	Langhorne
William Fitzhugh Rust, Jr.	Eng.	Pittsburgh
Robert James Schatz	Eng.	Allentown
Milton Ulrich Snyder	Eng.	Attica, N.Y.
John Moffatt Swalm, Jr.	Eng.	Pottsville
William Taddeo	Eng.	Reading
Lancey Thomson	Bus.	Rahway, N.J.
Ernest Wesley Thorn	Bus.	Bethlehem
Donald Lone Waidelich	Eng.	Allentown
Stephen John Wantuck	Eng.	Perth Amboy, N.J.
Bernard Samuel Weiss	Eng.	Philadelphia
William Joseph Wiswesser	Eng.	Reading

Sophomore Honors

William Bamert	Bus.	South Orange, N.J.
Parker Berg	Arts	Sewickley
Francis Wood Blanchard	M.E.	Pennington, N.J.
Thomas Edward Butterfield, Jr.	Arts	Bethlehem
James Monroe Clark	Bus.	Washington, D.C.
Arthur Stanley Cohen	Arts	Hagerstown, Md.
Walter Lorraine Deemer, Jr.	Arts	Quakertown
John Bauer Diefenbach	Arts	Westfield, N.J.
Samuel Efron	Arts	Allentown
William Smith Gallaway	Phys.	Rutherford, N.J.
Henry Peter George	Ch.E	Palmerton
Charles Adam Heiberger	Ch.E.	Allentown
Frank Joseph Hollister	E.E.	Sea Cliff, N.Y.
William Austin Johnson	Met.	Washington, D.C.
Edgar Gilpin Miller	Arts	Easton
Malcolm Stabler Muir	Arts	Williamsport
Samuel Brandt Nissley	M.E.	Salunga
Charles Jacob Rife	E.E.	Lemoyne
Edwin Albert Sawyer	Bus.	Bethlehem
Ralph E. Slonaker	Arts	Nazareth
Edward Snyder Tinley	E.E.	Allentown
LeRoy Otten Travis	Arts	Great Neck, N.Y.
William Seligman Weil, Jr.	E.E.	Philadelphia
John Raymond Wyatt	Arts	Martinsville, N.J.

Prizes

Wilbur Prizes, Freshman Year	
Mathematics, First Prize, $15	
Walter Richard Guyer	Allentown
Mathematics, Second Prize, $10	
John Moffatt Swalm, Jr.	Pottsville
English, $15	
Lancey Thomson	Rahway, N.J.
German, $15	
Manuel DePerez Lorenzo	Bethlehem
French, $15	
Gates Barnet Stern	Uniontown
Wilbur Prizes, Sophomore Year	
Mathematics, $10	
Divided between—	
William Austin Johnson	Washington, D.C.
William Seligman Weil, Jr.	Philadelphia
English, $10	
Arthur Stanley Cohen	Hagerstown, Md.
Physics, $10	
William Smith Gallaway	Rutherford, N.J.
Williams Freshman Prizes in Oral Composition	
First Prize, $40	
Bernard Samuel Weiss	Philadelphia
Second Prize, $15	
Robert Mills Eichner	Upper Montclair, N.J.
Williams Sophomore Prizes in English Composition	
First Prize, $50	
Samuel Efron	Allentown
Second Prize, $25	
Bradford Kimball Smith	Maplewood, N.J.
Third Prize, $15	
Thomas Edward Butterfield, Jr.	Bethlehem
Williams Junior Prizes in English Composition	
First Prize, $40	
Gellert Spencer Alleman	Wallingford
Second Prize, $15	
Leonard Hawkins Flisher	Oakville, Conn.
Mathematics Problem Prizes	
Robert Julius Myers	Elkins Park
Charles Martin Sandwick	Elmira Heights, N.Y.
Cary Bodley Jones	Kirkwood, Mo.
Charles Martin Sandwick	Elmira Heights, N.Y.
Honorable mention	
William Austin Johnson	Washington, D.C.

William H. Chandler Chemistry Prizes
Freshman Year, $25
Walter Richard Guyer — Allentown
Sophomore Year, $25
Charles Adam Heiberger — Allentown
Junior Year, $25
Milton Meissner — Plainfield, N.J.

Metallurgical Engineering Prize, Sophomore Year, $50
William Austin Johnson — Washington, D.C.

Alumni Junior Prizes
Mechanical Engineering, $25
Nelson Yeomans Coxe — Uniontown
Metallurgical Engineering, $25
Herman Frederick Graef — Stapleton, N.Y.

Wilbur Scholarship, $200—to the sophomore with the best record
William Austin Johnson — Washington, D.C.

Tau Beta Pi Prize (slide rule)—to the highest technical freshman
Bernard Samuel Weiss — Philadelphia

Eta Sigma Phi Medal—for the best work in sophomore collegiate Latin
Louis Eugene Citro — Freeland

Alpha Kappa Psi Medallion—to the highest ranking junior in Business Administration
Wilbur Charles Winblad — Brooklyn, N.Y.

Pi Tau Sigma Prize (handbook)—to the highest ranking freshman in Mechanical Engineering
Robert Mills Eichner — Upper Montclair, N.J.

Eta Kappa Nu Prize (handbook)—to the highest ranking freshman in Electrical Engineering
Donald Long Waidelich — Allentown

Phi Eta Sigma Cup—awarded to the living group whose freshmen (not fewer than five) have made the highest scholastic average for the year
Taylor Hall, Section C

Phi Sigma Kappa Scholarship Cup—awarded for one year to the fraternity in the Interfraternity Council having the highest scholarship average for the preceding year
Pi Lambda Phi

Trustees' Scholarship Cup—awarded for one year to the living group having the highest scholarship average for the preceding year
Leonard Hall

STUDENTS, 1933-1934

GRADUATE STUDENTS

Name	*Candidate for*	*Residence*
Ackerman, Clarence Samuel, B.S. *(East Stroudsburg State Teachers' College)*	M.S. (Major: Education)	Easton
Albright, Louise, A.B. *(Cedar Crest College)*	M.A. (Major: History)	Allentown
Allen, Edna May, Ph.B. *(Muhlenberg College)*	M.A. (Major: English)	Allentown
Althouse, Katharine Elvina, Mus.B. *(Syracuse University)*		Reading
Anderson, Judith, Ph.B. *(Muhlenberg College)*	M.A. (Major: History)	Bethlehem
Bachman, Walter Crawford, B.S. in I.E. *(Lehigh University)*	M.S. (Major: Ind. Eng.)	Nazareth
Beary, Joyce Elizabeth, B.A. *(Moravian College for Women)*	M.A. (Major: History)	Allentown
Bene, Frank, B.A. *(Lehigh University)*	M.A. (Major: Education)	Bethlehem
Benson, Arthur Leonard, B.A. *(Lehigh University)*	M.A. (Major: English	Easton, Md.
Bleam, Althea Gertrude, A.B. *(Cedar Crest College)*	M.A. (Major: Psychology)	Allentown
Blessing, Ruth Elizabeth, B.A. *(Moravian College for Women)*	M.A. (Major: History)	Bethlehem
Boyer, Harry Jeremiah, B.S. in Ch.E. *(Lehigh University)*		Egypt
Brandner, John David, B.S. in Ch.E. *(Lehigh University)*	M.S. (Major: Chemistry)	Easton
Brown, William Henry, B.S. *(Moravian College)*	M.A. (Major: Psychology)	Bethlehem
Carl, Howard Frederick, B.S. in Eng. Phy. *(Lehigh University)*	M.S. (Major: Physics)	Washington, D.C.
Carpenter, Marjorie Elizabeth, A.B. *(Cedar Crest College)*	M.A. (Major: Romance Languages)	Allentown
Check, Francis Joseph, A.B. *(St. Charles Seminary)*	M.A. (Major: Psychology)	Bethlehem
Ciastkewicz, Arthur Joseph, B.S. in M.E., M.S. in Met. *(Lehigh University)*		Hackettstown, N.J.
Coit, Barbara Kilburn, A.B. *(Pennsylvania College for Women)*		Clearwater, Fla.

Comins, Harrison Durgin, B.S. in C.E. *(Lehigh University)*	M.S. Vineland, N.J. (Major: Civil Eng.)
Connelly, John Robert, B.S. in M.E., M.S. *(University of Illinois)*	M.A. Bethlehem (Major: Education)
Conover, Lawrence John, B.S. in E.E., E.E. *(Lafayette College)*	M.S. Easton (Major: Electrical Eng.)
Creary, Albert Paddock, B.S., M.S. *(St. Lawrence University, Lehigh University)*	Canton, N.Y.
Dartt, Robert Lieb, B.A. *(Moravian College)*	M.A. Bethlehem (Major: Education)
Dewees, George Malcolm, B.S. in Ch.E. *(Lehigh University)*	M.S. West Chester (Major: Chemistry)
Dodson, Adams, B.A., LL.B. *(Yale University, Harvard University)*	M.A. Bethlehem (Major: History)
Ehrsam, Theodore George, B.A., M.A. *(Lehigh University)*	Tuchahoe, N.Y.
Engel, John Augustine, B.A. *(Lehigh University)*	M.A. Stamford, Conn. (Major: Geology)
Ether, Horace Fedor, B.S. *(Hobart College)*	M.S. Lake Ariel (Major: Chemistry)
Etter, Marion Dale, A.B. *(Colorado University)*	Bethlehem
Felton, Walter Wiest, B.S. in E.E. *(Lehigh University)*	M.S. Easton (Major: Electrical Eng.)
Fink, Lawson Jeremiah, A.B. *(Muhlenberg College)*	M.A. Albany (Major: Education)
Fischer, Frederic Philip, B.S. in E.E. *(Rutgers University)*	M.S. Milford (Major: Electrical Eng.)
Fitzpatrick, Ralph Norris, B.S. in Met.E. *(Lehigh University)*	M.S. Haverhill, Mass. (Major: Metallurgy)
Formhals, William Harry, B.S. in E.E. *(University of Illinois)*	M.S. Pittsburgh (Major: Electrical Eng.)
Fritz, William Charles, B.S. in Chem. *(Lehigh University)*	M.S. Bethlehem (Major: Chemistry)
Frye, John H., Jr., A.B. *(Howard College)*	M.S. Birmingham, Ala. (Major: Metallurgy)
Fuller, Merton Otis, C.E. *(Syracuse University)*	M.S. Bethlehem (Major: Civil Eng.)
Gearhart, Nevin, Ph.B. *(Muhlenberg College)*	Gilbert
Genszler, William George, Ph.B. *(Muhlenberg College)*	M.A. Allentown (Major: Education)

Godkin, Willard Joseph, B.S. in Chem. *(Moravian College)*	M.S. (Major: Bacteriology)	Bethlehem
Gray, Walter Henry, B.D. *(Virginia Theological Seminary)*		Bethlehem
Green, Charles Everard Joseph, B.S. in Ch.E. *(Lehigh University)*	M.S. (Major: Chemical Eng.)	Duluth, Minn.
Hall, Roberta Bowers, A.B. *(Smith College)*		Bethlehem
Hartman, Wellington Pursel, B.S. *(Susquehanna University)*	M.A. (Major: Education)	Danville
Heine, Lawrence Joseph, E.E. *(Lehigh University)*	M.S. (Major: Electrical Eng.)	Bethlehem
Herman, Lester Carl, B.S. in E.E. *(Lehigh University)*	M.S. (Major: Electrical Eng.)	Easton
Holmes, Ernest George Nosworthy, Ph.B., S.T.B. *(Wesleyan University, Boston University)*	M.A. (Major: Philosophy	Bethlehem
Jackson, Charles Marcellus, B.S. in Ch.E. *(Lehigh University)*	M.S. (Major: Chemical Eng.)	Philadelphia
Jennings, Burgess Hill, B.Eng. *(Johns Hopkins University)*	M.S. (Major: Mechanical Eng.)	Bethlehem
Johnston, Bruce Gilbert, B.S. in C.E. *(University of Illinois)*	M.S. (Major: Civil Eng.)	Bethlehem
Kantor, Max, B.Ch.Eng. *(University of Minnesota)*	M.S. (Major: Chemistry)	Minneapolis, Minn.
Kaufmann, Emerson Wertz, B.S. in Ch.E. *(Lehigh University)*	M.S. (Major: Chemical Eng.)	Wyomissing
Keat, Donald Bonney, B.S., M.A. *(Lafayette College, Lehigh University)*		Bangor
Kelley, Miriam Cope, B.S. *(Syracuse University)*	M.A. (Major: English)	Bethlehem
Ketcham, Henry Hendricks, E.E. *(Lehigh University)*		Bethlehem
Kistler, Richard Clinton, A.B. *(Muhlenberg College)*	M.A. (Major: English)	Lehighton
Kistler, Wilson Stephen, B.S. in Bus. Adm. *(Lehigh University)*		Stroudsburg
Klippert, Henry Laessle, B.A., M.A. *(Lehigh University, University of Southern California)*		Mountain Home
Kost, Kenneth Karl, B.A. *(Lehigh University)*	M.A. (Major: History)	Gary, Ind.
Kuebler, William Edward, B.S. *(East Stroudsburg State Teachers' College)*	M.A. (Major: Education)	Easton

Kuehner, Arlyle Kathleen, B.A. *(Moravian College for Women)*	M.A. (Major: History)	Bethlehem
Kyle, Peter Edward, M.E. *(Cornell University)*	M.S. (Major: Mechanical Eng.)	Lakeport, N.H.
Lafferty, Isabel Morrison, B.S. *(Oklahoma City University)*		Bethlehem
Leibensperger, Grace D., B.S. *(New York University)*		Allentown
Lilly, Helen Mary, B.A. *(Pennsylvania State College)*	M.A. (Major: Latin)	Bethlehem
Lobb, Thornton Reginald, A.B. *(Moravian College)*	M.A. (Major: Latin)	Bethlehem
Lohse, John Mueller, B.S. in Eng. Phys. *(Lehigh University)*	M.S. (Major: Geology)	Glen Ridge, N.J.
Lotz, Benjamin, A.B. *(Wittenberg College)*		Bethlehem
Lucas, Blanche Wingert, B.S. *(New York University)*	M.A. (Major: English)	Allentown
Macadam, Nathan Griffith, B.A. *(Lehigh University)*	M.A. (Major: Education)	Catasauqua
Marx, Lydia Elizabeth, A.B. *(Salem College)*	M.A. (Major: Latin)	Nazareth
Maurer, Joseph Abele, A.B. *(Moravian College)*	M.A. (Major: Latin)	Bethlehem
McCarthy, Frank Joseph, Jr., B.S. in Bus.Adm. *(Lehigh University)*	M.A. (Major: Education)	Bethlehem
Miller, Gladys Krause, A.B. *(Cedar Crest College)*	M.A. (Major: Latin)	Allentown
Mumbauer, Eleanor Dengler, B.A. *(Moravian College for Women)*	M.A. (Major: English)	Bethlehem
Myers, James Franklin, B.S. *(Moravian College)*	M.A. (Major: Education)	Bethlehem
Myers, Philip Benham, B.A. *(Lehigh University)*	M.S. (Major: Geology)	Kingston
Nagy, Eugene Guaney, B.S. *(Moravian College)*	M.A. (Major: Education)	Bethlehem
Neville, Ilda, B.A. *(Smith College)*	M.A. (Major: Education)	Bethlehem
Nonnemaker, Warren Francis, B.A., B.D. *(Moravian College)*	M.A. (Major: History)	Bethlehem
Osborn, Harry Brooks, Jr., B.S. in Ch.E. *(Lehigh University)*	M.S. (Major: Chemical Eng.)	Newark, N.J.
Overholt, John Lough, B.S. in Ch.E. *(Iowa State College)*	M.S. (Major: Chemical Eng.)	Webster City, Iowa

Payrow, Harry Gordon, B.S. in C.E.	Bethlehem
(Tufts College)	
Payrow, Lillian Gordon, A.B.	M.A. Bethlehem
(Cedar Crest College)	(Major: Education)
Pentz, Harold Henry, B.S. in E.M.	M.S. Bethlehem
(Lehigh University)	(Major: Mining Eng.)
Rabinowitz, Benjamin, B.S. in Ch.E.	M.S. Scranton
(Lehigh University)	(Major: Chemistry)
Reichard, Rovena Ethel Adele, A.B.	M.A. Allentown
(Cedar Crest College)	(Major: History)
Reitinger, Harry Emerson, B.S.	Beverly, N.J.
(University of Pennsylvania)	
Reynolds, Peter Graham, B.S. in M.E.	M.S. Bethlehem
(Lehigh University)	(Major: Mechanical Eng.)
Riegel, William Abram, Jr., A.B., M.A.	Catasauqua
(University of Pennsylvania)	
Rights, Fred Lewis, B.S. in Ch.E.	M.S. Bethlehem
(Lehigh University)	(Major: Bacteriology)
Robar, Henry John, B.S. in Met.E.	M.S. Bethlehem
(Lehigh University)	(Major: Metallurgy)
Rosencrans, Charles Arthur, B.S. in E.E.	M.S. Warwick, N.Y.
(Lehigh University)	(Major: Electrical Eng.)
Schaeffer, Austin M., B.S.	M.A. Allentown
(Franklin & Marshall College)	(Major: Education)
Schlotter, Ellwood Steffan, Ph.B.	M.A. Bethlehem
(Muhlenberg College)	(Major: Education)
Schreiner, Norman George, C.E.	M.S. Philadelphia
(Lehigh University)	(Major: Civil Eng.)
Schulte, William Chester, B.S., M.S.	Bethlehem
(University of Illinois, University of Wisconsin)	
Seiple, Norman Kline, B.S.	M.A. Bethlehem
(Muhlenberg College)	(Major: Education)
Serfass, Earl James, B.S. in Ch.E.	M.S. Allentown
(Lehigh University)	(Major: Chemical Eng.)
Shimer, Stewart Applegate, Jr., B.S. in Eng. Phys.	M.S. Bethlehem
(Lehigh University)	(Major: Physics)
Somers, William Eugene, B.S. in M.E.	M.S. Poland, O.
(Lehigh University)	(Major: Mechanical Eng.)
Somerville, John Jeffrey, B.S. in Bus. Adm.	M.A. Bethlehem
(Lehigh University)	(Major: History)
Stauffer, Robert Lehr, Ph.B.	Allentown
(Muhlenberg College)	
Stewart, Douglas Macmillan, A.B., B.S. in C.E.	M.S. Bethlehem
	(Major: Civil Eng.)
(Brown University, Massachusetts Institute of Technology)	

Strauch, Carl Ferdinand, B.A. *(Muhlenberg College)*	M.A. Allentown (Major: English)
Swope, Dorothy Slater, B.A. *(Moravian College for Women)*	M.A. Allentown (Major: English)
Tage-Nielsen, Axel, B.S. in Ch.E. *(Lehigh University)*	M.S. Elizabeth, N.J. (Major: Chemistry
Taylor, Robert Scott, B.S. in Ch.E. *(Lehigh University)*	M.S. Pottsville (Major: Chemistry)
Taylor, William John, Jr., B.S. in Ch.E. *(Lehigh University)*	M.S. Pottsville (Major: Chemistry)
Ten Eyck, Hugh Skillman, B.S. in Met.E. *(Lehigh University)*	M.S. Bethlehem (Major: Metallurgy)
Thom, George Boyd, M.E., M.S. *(Lehigh University)*	Bethlehem
Thorne, Albert Monforte, Jr., B.S. in Eng. Phys. *(Lehigh University)*	M.S. Richmond Hill, N.Y. (Major: Physics)
Uhler, Eugene Henry, C.E. *(Lafayette College)*	Bethlehem
Watkins, Thomas William, Jr., A.B. *(Dickinson College)*	M.A. Coopersburg (Major: Education)
Wilkinson, Donald Elverson, B.S. in Bus. Adm. *(Lehigh University)*	M.A. Meriden, Conn. (Major: History)
Williams, Benjamin Crispin, Ph.B. *(Lafayette College)*	M.A. Catasauqua (Major: Education)
Wilson, Haidee Idalea, A.B. *(Cedar Crest College)*	M.S. Reading (Major: Biology)
Witmeyer, Marianne Gladys, B.A. *(Moravian College for Women)*	M.A. Bethlehem (Major: English)
Young, William Cope, B.S. in E.E. *(Lehigh University)*	M.S. East Orange, N.J. (Major: Electrical Eng.)
Zapffe, Carl Andrew, B.S. *(Michigan College)*	M.S. Blainerd, Minn. (Major: Metallurgy)

UNDERGRADUATE STUDENTS

Arts—Arts and Science	E.M.—Mining Engineering
Bus.—Business Administration	Eng.—Freshman Engineering
Ch.E.—Chemical Engineering	I.E.—Industrial Engineering
Chem.—Chemistry	M.E.—Mechanical Engineering
C.E.—Civil Engineering	Met.—Metallurgical Engineering
E.E.—Electrical Engineering	Phys.—Engineering Physics

Abbe, Richard Taylor	Bus.,'34	Kennett Square
Abbe, Robert	Bus.,'34	Lansdowne
Abbott, John Harold	Arts,'35	Allentown
Abrams, Simon Mervin	E.E.,'36	Freeland
Abse, David Isadore	Bus.,'36	Bethlehem
Ackerman, John Hane	Bus.,'36	Summit, N.J.
Ackerson, Cornelius	E.E.,'35	Keyport, N.J.
Adamson, John Howard	Arts,'36	Meyersdale
Agocs, William Bailey	E.M.,'34	Freemansburg
Ahrenholz, Herman William, Jr.	Eng.,'37	New York, N.Y.
Aicher, Edward Franklin	Met.,'36	Easton
Airgood, Wilmer Harold	Eng.,'37	Big Run
Alderman, Robin Karl	Bus.,'37	Beacon, N.Y.
Aldrich, Richard George	Arts,'37	Huntington, Mass.
Alleman, Gellert Spencer	Arts,'34	Wallingford
Allen, Charles Barnett	Met.,'36	Philadelphia
Allison, Robert Price, Jr.	M.E.,'36	Schenectady, N.Y.
Alper, Norman	Arts,'34	Providence, R.I.
Ambruster, Watson, III	I.E.,'35	Westfield, N.J.
Anderson, Guy Dill	Bus.,'37	Forest Hills, N.Y.
Anderson, Lloyd David	E.E.,'34	Red Lion
Angle, William Dimmick	Eng.,'37	Stroudsburg
Antrim, William Drown, Jr.	M.E.,'36	Gloucester, N.J.
Archer, Harry Clark	Arts,'37	Caldwell, N.J.
Ash, William John, Jr.	Eng.,'37	Ridgewood, N.J.
Ashman, Rudolph Richard	Eng.,'37	Butztown
Austin, William Edward	I.E.,'36	Maplewood, N.J.
Bachman, Thomas McFall	Eng.,'37	Allentown
Badger, Kern Churchill	Eng.,'37	Ridgewood, N.J.
Bailey, Albert Tanner, Jr.	M.E.,'34	Montclair, N.J.
Bailey, Joseph Taylor	Eng.,'37	Bloomfield, N.J.
Bailey, Robert Louis	Bus.,'37	Montclair, N.J.
Bailey, William Arthur, Jr.	M.E.,'36	Baltimore, Md.
Baillie, John William	Ch.E.,'34	Bethlehem
Baiter, Richard Justin	Bus.,'37	Maplewood, N.J.
Baizley, Rudolph Sutcliffe	Bus.,'36	Philadelphia
Baker, Arthur Ephraim	Bus.,'35	Jamaica, N.Y.
Baker, Joseph Boyd, III	C.E.,'34	Pittsburgh
Bakker, Wilbert	Eng.,'37	Midland Park, N.J.

Ball, Henry Alvin	Eng.,'37	Pittsburgh
Ball, Hiram Price	Arts,'37	Pittsburgh
Ballenger, Carl Hermon	Eng.,'37	Washington, D.C.
Balliet, Claude Samuel	Ch.E.,'36	Catasauqua
Bamert, William	Bus.,'35	South Orange, N.J.
Barker, George Andrew, Jr.	Eng.,'37	Allentown
Barker, John Stevenson, Jr.	Eng.,'37	Pittsburgh
Barnes, Allen Earl, Jr.	C.E.,'34	Philadelphia
Barnes, Marshall Curtis	Eng.,'37	Rockville Center, N.Y.
Barnum, Donald Curtis	Eng.,'37	Upper Montclair, N.J.
Barrow, George Robert	Met.,'34	Enola
Bartlett, Clark Orrin	E.E.,'36	East Orange, N.J.
Battin, Henry Samuel	Bus.,'37	Philadelphia
Baum, August Hinrichs	Bus.,'35	Westfield, N.J.
Baumann, Leonard Leopold	Arts,'36	Liberty, N.Y.
Bavington, Robert Francis	Bus.,'34	Philadelphia
Baxter, Malcolm Hume	Ch.E.,'35	New York, N.Y.
Bayer, Curtis Frederick Anselem	Bus.,'36	Scarsdale, N.Y.
Beacher, Benjamin Donald	E.E.,'35	Allentown
Beal, Thomas James	C.E.,'36	Meyersdale
Beatty, Kenneth Orion, Jr.	Ch.E.,'35	Drexel Hill
Beck, George Henry	Eng.,'37	Irvington, N.J.
Becker, Carl David	Eng.,'37	Shillington
Bedard, Gabriel Oscar	E.E.,'34	Allentown
Beeson, Colin Reed	Bus.,'35	Four States, W.Va.
Beidler, Henry Landis	Ch.E.,'36	Quakertown
Beidler, John Kaufman	Bus.,'35	Oakville
Beisel, Bruce Broughton	Bus.,'37	Easton
Beiter, Harry Nevison	Bus.,'35	Elyria, O.
Bell, George Tillman, Jr.	Bus.,'34	Washington, D.C.
Belser, Anthony Albert, Jr.	I.E.,'35	Plainfield, N.J.
Benner, Henry Lester	M.E.,'36	Lederach
Bennett, Charles Eugene	Bus.,'36	West Hempstead, N.Y.
Bennett, Chester Earl	Arts,'36	Belmar, N.J.
Bentz, Russell Herman	Ch.E.,'35	York
Berg, Lloyd	Ch.E.,'36	Paterson, N.J.
Berg, Parker	Arts,'35	Sewickley
Berger, Jerome James	Bus.,'34	Peekskill, N.Y.
Berkowitz, Morton Seymour	Arts,'37	Brookline, Mass.
Berman, Morton	Eng.,'37	Norristown
Bernard, Clifford Vail	Eng.,'37	Summit, N.J.
Berutich, John Mathew	Eng.,'37	New York, N.Y.
Besosa, Frank Adolfo	Bus.,'34	Flushing, N.Y.
Besosa, Gustavo Adolfo, Jr.	Bus.,'37	Flushing, N.Y.
Bewley, Frank Wilson	Ch.E.,'34	Pottstown
Bickel, Harold Clayton	E.E.,'36	Philadelphia
Bigelow, Claude Illingsworth	Ch.E.,'35	Rockville Center, N.Y.
Bilger, Walter Gibson	E.M.,'36	Philadelphia
Bilinsky, Anthony	Arts,'36	Freeland
Billheimer, George Lee	Arts,'34	Harrisburg

Biondi, Frank Joseph	Ch.E.,'36	Allentown
Bishop, Ben Leon	Arts,'34	Manheim
Black, Lewis Charles	E.M.,'35	Gloucester, N.J.
Blair, Harold Herman	Eng.,'37	Stroudsburg
Blanchard, Francis Wood	M.E.,'35	Pennington, N.J.
Blasky, Harold Fredric	Bus.,'35	Newark, N.J.
Bloom, Kenneth Gordon	Bus.,'35	Agawam, Mass.
Blumenthal, Jacob, Jr.	Eng.,'37	Elkins Park
Blumenthal, Samuel Kahn	Arts,'35	Elkins Park
Blythe, Ralph Masland	E.M.,'36	Philadelphia
Boarman, Robert Woodruff	Eng.,'37	Springfield
Bock, Charles Frederick	Phys.,'36	Caldwell, N.J.
Boden, Marston Hall	I.E.,'36	Flushing, N.Y.
Bodine, Robert Yeomans	Eng.,'37	Bethlehem
Bogert, Joseph Calvin	Eng.,'37	Allentown
Bohning, William Harvey	Arts,'34	Bethlehem
Bolton, Wilson W., Jr.	Bus.,'34	York
Bomberger, David Claude	E.E.,'34	Reading
Bonkemeyer, Amos Colbert, Jr.	M.E.,'36	Greensboro, N.C.
Bonner, Bruce Barrows	Eng.,'37	West Hartford, Conn.
Bonner, Harold William	Eng.,'37	Allentown
Bonnett, Horace Wilson	M.E.,'36	Aberdeen, Md.
Boquel, Joseph Peter	Bus.,'35	Bethlehem
Bornstein, Alfred Bertraum	Eng.,'37	Bethlehem
Borowsky, Francis Joseph	Bus.,'37	Philadelphia
Borton, Richard Alwyn	Ch.E.,'35	South Orange, N.J.
Bosak, Joseph John	M.E.,'35	Olyphant
Bowden, Charles Warren, Jr.	Eng.,'37	Philadelphia
Bowden, George Lavin	Eng.,'37	Philadelphia
Boyer, Loraine Maurice	Arts,'37	Red Hill
Brandt, Charles Cox, Jr.	E.E.,'35	Newport
Branegan, James Augustus, Jr.	Chem.,'35	Drexel Hill
Brant, Irvin Longaker	Bus.,'37	Norristown
Branyan, Stuart Gailey	Eng.,'37	Enola
Braunberns, James Edward	Met.,'35	Warren, O.
Brettell, George Alvin, Jr.	Phys.,'36	Newark, N.J.
Brewer, Leonard	Ch.E.,'35	Delaware Water Gap
Brisker, Sydney Hirsch, II	I.E.,'36	Bethlehem
Britton, Horace Ely	Bus.,'34	Pelham, N.Y.
Brodhead, Woodruff Martin	I.E.,'34	Elizabeth, N.J.
Brooke, Roger	Eng.,'37	Washington, D.C.
Brookover, Thomas Edward	Eng.,'37	Downington
Brooks, Harold Taylor	I.E.,'36	Upper Montclair, N.J.
Broughal, Edward Joseph	Bus.,'37	Bethlehem
Brown, Charles Elmer	Eng.,'37	Akron, O.
Brown, Joseph Francis	Eng.,'37	Lyndhurst, N.J.
Brown, Ralph Wilson	I.E.,'36	Plainfield, N.J.
Brown, Silas Mahona, Jr.	Eng.,'37	Bethlehem
Brown, Theodore Richard	Eng.,'37	Essex Fells, N.J.
Browne, Benjamin Wildman	Arts,'37	Aurora, O.

Browne, Gerard Lakin	Arts,'36	Buffalo, N.Y.
Brownlee, John Frederick	I.E.,'35	Geneva, N.Y.
Brunn, Herbert Theodore	Bus.,'34	Brooklyn, N.Y.
Buchanan, Robert Williams	Arts,'35	Maplewood, N.J.
Buck, Richard Benn	Arts,'35	Williamstown, N.J.
Budura, Paul	Arts,'35	Bethlehem
Bugbee, Charles Kendall	Eng.,'37	Trenton, N.J.
Bullard, Joseph William Camp, Jr.	Eng.,'37	Southport, Conn.
Bunch, Tillman Tenney	Bus.,'37	Washington, D.C.
Burg, Robert Joseph	Bus.,'34	Bethlehem
Burke, Thomas William	Arts,'34	Allentown
Burkhardt, Michael Ferdinand	Arts,'35	Bethlehem
Butterfield, John Parker	I.E.,'36	Bethlehem
Butterfield, Thomas Edward, Jr.	Arts,'35	Bethlehem
Butz, George Alpha	Ch.E.,'36	Schuylkill Haven
Buys, Howard George	Eng.,'37	Sayville, N.Y.
Byers, Richard McCulloch	E.E.,'34	Catonsville, Md.
Byrne, Philip Joseph	Arts,'36	Bethlehem
Cabassa, Herman Forrest	Bus.,'35	West Chester
Cahalan, William James, Jr.	C.E.,'35	East Orange, N.J.
Calhoun, Lawson Peel	C.E.,'36	Atlanta, Ga.
Campbell, James Bannon	Arts,'34	Pittsburgh
Campbell, Robert Craig, Jr.	Bus.,'35	Rochester
Campbell, William Francis, Jr.	M.E.,'36	Nyack, N.Y.
Canfield, William Benjamin	Chem.,'36	Caldwell, N.J.
Canning, Francis Joseph	Arts,'34	Cranford, N.J.
Canova, Remo	Arts,'34	Allentown
Carey, Frank Goodwin	Bus.,'37	New Haven, Conn.
Carlile, Norman Alfred Henry	E.M.,'34	Philadelphia
Carlin, Joseph William	Eng.,'37	Stamford, Conn.
Carpenter, Allan Brooks	Eng.,'37	Corning, N.Y.
Carr, Merton Crawford	Bus.,'34	Buffalo, N.Y.
Case, Roy Irving, Jr.	E.E.,'35	Racine, Wis.
Chambers, Charles Reed	Bus.,'34	Audubon, N.J.
Chapman, Alfred George	I.E.,'36	Carbondale
Chapman, Denman Scott	Bus.,'36	Milwaukee, Wis.
Chapman, Harold Diehl	Eng.,'37	Elizabeth, N.J.
Charlton, James Maxwell	Bus.,'34	Scarsdale, N.Y.
Chickering, Edwin Shepard	I.E.,'35	Oil City
Cilley, Donald Lesley	Eng.,'37	Lancaster
Citret, Coleman	Arts,'37	Newark, N.J.
Citro, Louis Eugene	Arts,'35	Freeland
Clark, Diar Ellsworth	E.E.,'34	Deposit, N.Y.
Clark, George Stewart, Jr.	Eng.,'37	White Plains, N.Y.
Clark, James Monroe	Bus.,'35	Washington, D.C.
Clarke, Joseph Murray	I.E.,'35	Sparrows Point, Md.
Clemens, Bernard Frederick	Bus.,'37	Stroudsburg
Cliver, Laurence Gordon	Ch.E.,'34	Niagara Falls, N.Y.

Close, Courtney Taft	E.E.,'34	Dunmore
Close, Edwin McDowell	Bus.,'37	Red Bank, N.J.
Clough, Raeburn	Eng.,'37	Mount Vernon, N.Y.
Clow, Wesley Ludlow	E.M.,'36	Pine Castle, Fla.
Coan, Hilliard Jerome	Bus.,'37	Freeport, N.Y.
Coburn, John Walton	Arts,'36	Philadelphia
Cochrane, Eugene Harold, Jr.	Arts,'37	Elizabeth, N.J.
Cohen, Arthur Stanley	Arts,'35	Hagerstown, Md.
Cohen, Bernard Louis	Arts,'36	Albany, N.Y.
Cohen, Bertram Arnold	Arts,'36	Paterson, N.J.
Colbaugh, Robert Crawford, Jr.	I.E.,'35	Wilkinsburg
Colitz, Michael John	E.M.,'35	Pottsville
Coll, Christopher Thomas, Jr.	Bus.,'36	Miami Fla.
Collander, Carl Edward	C.E.,'35	Newark, N.J.
Collins, Clyde Abraham	Arts,'36	Scranton
Collins, Edmund, III	Bus.,'36	Allentown
Comstock, Walter Goemann	Bus.,'35	Grantwood, N.J.
Conn, Doak Oswin	Eng.,'37	Latrobe
Connors, James Francis, Jr.	Arts,'37	Bethlehem
Conrad, William Griffith	Eng.,'37	Lancaster
Conti, Arthur	Arts,'37	Brooklyn, N.Y.
Conti, Vincent	Arts,'34	Brooklyn, N.Y.
Cook, Frederick Augustus	Bus.,'37	Dutch Neck, N.J.
Cook, Weston Carrier	Arts,'36	Allentown
Cooke, Thomas Dickerson	Bus.,'35	Kenilworth, Ill.
Cooley, Charles Freeland	Ch.E.,'34	Pennington, N.J.
Cooney, Robert Lee	Eng.,'37	Bethlehem
Cooper, Donald Treat	E.E.,'36	Philadelphia
Cooper, John Kenneth	Bus.,'37	Forty Fort
Cooper, Lloyd Ryder	Ch.E.,'35	Coopersburg
Cooper, Sidney Johnston	Eng.,'37	Oxford, Md.
Cooper, William Herbert	I.E.,'35	Drexel Hill
Corby, Edward Newton	Arts,'37	Perkasie
Cornelius, John de Benneville	Arts,'35	Cynwyd
Cottrell, Alfred	E.E.,'34	Washington, D.C.
Couch, Robert deSchweinitz	Bus.,'37	Bethlehem
Coulter, William Smeltz	Eng.,'37	Lancaster
Coventry, John Roberts	Bus.,'36	Hibbing, Minn.
Cowenhoven, John, III	I.E.,'35	East Orange, N.J.
Cox, Irving John, Jr.	Eng.,'37	Wilmington, Del.
Coxe, Nelson Yeomans	M.E.,'34	Uniontown
Craft, Norman Willet	Ch.E..'35	Cedarhurst, N.Y.
Crane, William	Bus.,'36	Westfield, N.J.
Cranmer, Richard Stephen	Arts,'36	Philadelphia
Crispen, Robert Elwood	Eng.,'37	Glenside
Crockett, Walter Prentice	M.E.,'36	Lancaster
Croes, John Arthur Joseph	Ch.E.,'36	New York, N.Y.
Croll, Arthur	M.E.,'36	Buffalo, N.Y.
Cromwell, Elwood Van Rensselaer	Bus.,'37	Bethlehem

Croushore, James Henry	Arts,'36	Bethlehem
Culver, Donald Cooper	Phys.,'35	Laurel, Del.
Cummings, Vail William	I.E.,'36	Maplewood, N.J.
Curren, Arthur Thomas	Eng.,'37	New Dorp, N.Y.
Curtis, Roger Sumner	Eng.,'37	Devon
Custer, Robert Hutchinson	M.E.,'36	Mt. Vernon, N.Y.
Daddow, Theodore R., Jr.	M.E.,'36	Pottsville
Daubenspeck, Benjamin Keck	Eng.,'37	Allentown
Davenport, Theodore	C.E.,'36	Netcong, N.J.
David, David Gabriel	Ch.E..'36	Philadelphia
Davis, John Lawrence	Bus.,'36	Red Bank, N.J.
Davis, Norval Baron	Bus.,'36	Wheeling, W.Va.
Davis, William Robert	Ch.E.,'35	Lansford
Deacon, Alexander Jay, Jr.	Eng.,'37	Pittsburgh
Deacy, William Henry, III	E.E.,'35	Ossining, N.Y.
Deale, Blair Bowditch	Bus.,'35	Greenport, N.Y.
Deale, Donald Wilcox	Bus.,'37	Greenport, N.Y.
Decker, Douglas Ellwood	Eng.,'37	Nicholson
Decker, Robert Edgar	Bus.,'34	Easton, Md.
Deemer, Walter Lorraine, Jr.	Arts,'35	Quakertown
DeForeest, Edward Tucker	M.E.,'34	Newark, N.J.
Deibert, Edward Bader	Bus.,'36	Hellertown
Deily, Richard Leo	Arts,'34	White Plains, N.Y.
deJourno, Jacques Leon	Bus.,'36	Allentown
DeLand, Louis Mason	C.E.,'36	Washington, D.C.
DelFavero, Louis Vincent	Eng.,'37	Columbia, N.J.
Demarest, Harold Hunt	Bus.,'34	Bloomfield, N.J.
deMeli, Henry Anthony	Bus.,'35	New Brighton, N.Y.
Dempsey, James Gerard	Arts,'37	Bethlehem
Dempsey, Thomas Francis	Arts,'34	Bethlehem
deNarvaez, Charles Agustin	Eng.,'37	Bogota, Colombia, S.A.
Denise, Charles Meirs, Jr.	C.E.,'35	Bethlehem
Dent, Henry Hewitt	Eng.,'37	Allentown
DePuy, Edward DeWitt	M.E.,'36	Brooklyn, N.Y.
Dickerson, Randal Levin	Ch.E.,'35	Laurel, Del.
Dickinson, Lee Irving	Met.,'36	Buffalo, N.Y.
Dickover, George Fancourt	Ch.E.,'36	Kingston
Diefenbach, John Bauer	Arts,'35	Westfield, N.J.
Diefenthaler, David Arnold	Arts,'36	Chatham, N.J.
Diener, Karl Miller	Bus.,'34	Hamburg
Dieter, Emil Allen	Arts,'37	Allentown
Dietz, Carl Alford	I.E.,'35	Summit, N.J.
Dietz, John Wilson	Bus.,'36	Summit, N.J.
Disque, Karl Frederick	Eng.,'37	Wilkes-Barre
Doney, William Leonard	Eng.,'37	Pen Argyl
Dornblatt, Frederick	Arts,'37	Bethlehem
Dornin, George Armstrong, Jr.	M.E.,'35	Baltimore, Md.
Doubleday, Thomas Patten	Bus.,'34	Cooperstown, N.Y.
Dougherty, Robert Starrs, Jr.	Bus.,'36	Bethlehem
Downing, Robert Edward	M.E.,'36	Greenport, N.Y.
Dryer, Robert Alexander	Arts,'37	Scarsdale, N.Y

Dreyfus, Jack Jonas, Jr.	Arts,'34	Montgomery, Ala.
Driscoll, Robert Cameron	E.E.,'36	Philadelphia
Drury, John, Jr.	Bus.,'37	West Pittston
Druschel, Charles Henry	Eng.,'37	Columbia
Duchynski, Robert Henry	Eng.,'37	Reading
Dunlap, Harold Frederick	Bus.,'36	Altoona
Dunlap, Kermit Shoff	Eng.,'37	Altoona
Dunlap, William Berger	Eng.,'37	Pittsburgh
Dwyer, John Gerald	Eng.,'37	Bethlehem
Eagan, John William, Jr.	Met.,'34	Youngstown, O.
Earich, Robert Allen George	Chem.,'34	Bethlehem
Eby, Martin Christian	Ch.E.,'34	New Holland
Eckles, Charles Cook	M.E.,'35	New Castle
Eckstein, David	Arts,'34	Trenton, N.J.
Eddleman, Edward Maurice	Bus.,'34	Philadelphia
Edgcumbe, Charles Diehl	Ch.E.,'36	Roselle Park, N.J.
Edwards, John Beitel	Met.,'36	Bethlehem
Efron, Samuel	Arts,'35	Allentown
Ehlers, Henry Edward, Jr.	Bus.,'34	Philadelphia
Ehmann, Neville Howell	I.E.,'36	Brookline
Eichelberger, Lewis Hay, Jr.	M.E.,'34	Eagle Pass, Tex.
Eichner, Robert Mills	M.E.,'36	Montclair, N.J.
Eisenstadt, Gilbert Stanley	Arts,'34	Brooklyn, N.Y.
Elder, Ned Seidel	Bus.,'37	South Williamsport
Elder, Robert	Bus.,'35	South Williamsport
Ellis, Harry Kaler, Jr.	E.E.,'35	Phoenixville
Ellison, Stanley Russell	I.E.,'35	South Orange, N.J.
Engel, Edwin Herman	Met.,'34	Plainfield, N.J.
English, Earl Rowland	Bus.,'34	Upper Montclair, N.J.
English, Harrison Force, III	Arts,'34	Trenton, N.J.
Engstrom, Victor Eugene	Bus.,'36	Montclair, N.J.
Enscoe, Roger	C.E.,'36	Port Washington, N.Y.
Enzian, George Henry	Met.,'35	Pittsburgh
Ertle, Lawrence Joseph	Ch.E.,'35	Pittsburgh
Escobedo, Gilberto	C.E.,'36	Mexico City, Mex.
Estrada, Ralph, Jr.	Bus.,'37	Havana, Cuba
Evans, David Daniel	M.E.,'34	Scranton
Evans, John Orville	Ch.E.,'34	Washington, D.C.
Evans, Morton Ridgway	E.E.,'36	Glen Rock, N.J.
Everett, Harvey James	M.E.,'35	Allentown
Everett, William Wade, Jr.	Bus.,'34	Washington, D.C.
Everitt, Edgar Roger	Bus.,'37	Jamaica, N.Y.
Fairbanks, Warren Park	Eng.,'37	South Ardmore
Farnham, Robert, Jr.	Arts,'36	Philadelphia
Farnsler, Herbert Forrest	E.E.,'36	Harrisburg
Farr, Gilmore Lloyd	Eng.,'37	Holyoke, Mass.
Farr, William Maxwell	Arts,'37	Allentown
Faust, Delbert Grant	E.E.,'34	Philadelphia
Fay, Joseph Edmund	I.E.,'35	West Pittston
Fehr, Harold George	I.E.,'36	Pen Argyl
Feinblatt, Leonard	Bus.,'37	Mt. Vernon, N.Y.

Feldhus, William Herman	Bus.,'37	Hollis, N.Y.
Feldman, Harry Alfred	Arts,'35	Newark, N.J.
Fentress, David Wendell	Bus.,'36	Winnetka, Ill.
Ferguson, Francis Harvey	Eng.,'37	Bala-Cynwyd
Ferguson, John Berton, Jr.	Eng.,'37	Hagerstown, Md.
Ferris, John Guy	C.E.,'34	Allentown
Ferry, John Jude	Ch.E.,'34	Bethlehem
Fetterman, Jay Vincent	Eng.,'37	Allentown
Field, Joseph	Arts,'36	Berwick
Finlay, Walter Leonard	Ch.E.,'36	Brooklyn, N.Y.
Firling, Christian Winslow	Eng.,'37	Ridgewood, N.J.
Fischer, Martin John	Bus.,'37	Montclair, N.J.
Fishel, John Beverly	Chem.,'36	Hagerstown, Md.
Fisher, Harry Mueller	Ch.E.,'34	Drexel Hill
Fisher, William Wallace, Jr.	I.E.,'34	Orange, N.J.
Fismer, William Lucius	M.E.,'34	Verona, N.J.
Flisher, Leonard Hawkins	Arts,'34	Oakville, Conn.
Foering, Howard Augustus, Jr.	Phys.,'35	Bethlehem
Foland, Jackson Edward	Met.,'36	Plainfield, N.J.
Folkner, Maurice Harvey	Met.,'35	Buttzville, N.J.
Ford, Charles Harry	E.E.,'36	Forest Hills, N.Y.
Ford, Hamilton Gates	Bus.,'34	Ridgewood, N.J.
Ford, Harold Stanley, Jr.	Bus.,'37	Ridgewood, N.J.
Ford, Howard Holmes, Jr.	Bus.,'35	Ridgewood, N.J.
Ford, Howard Lay	Bus.,'36	Upper Montclair, N.J.
Ford, William Michaux	Bus.,'34	New Harmony, Ind.
Fortman, Bernard Gerard, Jr.	I.E.,'34	Pearl River, N. Y.
Foscue, Garland, Jr.	Bus.,'35	Merion
Foster, Elliott Orman, Jr.	Arts,'37	Millbury, Mass.
Foster, Kenneth Leroy	I.E.,'34	Rockville Centre, N.Y
Fouse, Donald Weber	Eng.,'37	Harrisburg
Fox, Beauvais Baugh, Jr.	I.E.,'34	New York, N.Y.
Frank, Herbert	Bus.,'37	Albany, N.Y.
Frankenfield, Charles Walter	M.E.,'34	Coopersburg
Frauenfelder, Lewis Jacob	Ch.E.,'36	Topton
Frazee, Edward Blackwell	Chem.,'35	Bethlehem
Freed, Howard Biehn	Arts,'37	Quakertown
Freed, William Charles	Ch.E.,'36	Richlandtown
Freedman, Alan Morton	Eng.,'37	Youngstown, O.
Freeman, Charles David	Bus.,'37	Nazareth
Frick, Arthur Biery	M.E.,	Allentown
Frick, Bernard LeRoy	C.E.,'34	Lebanon
Frick, John Arthur, Jr.	Bus.,'36	Allentown
Friedel, Warren Wien	Ch.E.,'35	Philadelphia
Fritz, Charles Leslie	Bus.,'34	Westfield, N.J.
Frome, Walter Godfrey	Eng.,'37	Belvidere, N.J.
Fruehan, Willard	Met.,'35	Scranton
Fry, Nelson Becker, Jr.	I.E.,'34	Philadelphia
Fugard, John Reed	C.E.,'35	Evanston, Ill.
Fuller, Donald Craig	Bus.,'37	Summit, N.J.
Fuller, James Osborn	Arts,'34	Bethlehem

Furman, Millard Robert	Bus.,'35	Newark, N.J.
Gabell, Boyden Richardson	Bus.,'35	Philadelphia
Gaimo, Thomas Leonard	Eng.,'37	Hoboken, N.J.
Gallagher, Charles Edward	Bus.,'36	New York, N.Y.
Gallagher, Edward Spring	M.E.,'36	Great Neck, N.Y.
Gallaher, Howard Scott	E.E.,'36	Trenton, N.J.
Gallaway, William Smith	Phys.,'35	Rutherford, N.J.
Galliher, John	Bus.,'36	Washington, D.C.
Garihan, Thomas Kenneth, Jr.	Bus.,'36	Bethlehem
Gates, Bernard Nieweg	Arts,'35	Tyrone
Gavin, John Daniel	E.E.,'36	Catasauqua
Gaviria, Gilberto Tamayo	Eng.,'37	Colombia, S.A.
Gearhart, Foster Lane	I.E.,'34	Palmerton
Gearhart, Thomas Allen	Arts,'36	Palmerton
Geehr, Homer Pyle	E.E.,'35	Quincy, Mass.
Geiger, Franklin Ezra	E.E.,'34	Hackensack, N.J.
Geiger, Lyle McCleary	Ch.E.,'36	Braddock
Geller, Samuel Cortley	Bus.,'34	Pittsfield, Mass.
George, Henry Peter	Ch.E.,'35	Palmerton
Gerlach, Earl Levengood	Bus.,'36	Doylestown
Giarraputo, Julian Anthony	Arts,'37	New York, N.Y.
Gibbons, Donald Jardine	Bus.,'36	Rahway, N.J.
Gibbs, Harold Arthur, Jr.	I.E.,'36	Jersey City, N.J.
Gibson, Glenn James	C.E.,'35	Hampton, N.J.
Gilmore, John Arthur	Arts,'35	California
Glading, Alfred Decatur, Jr.	C.E.,'36	Haddonfield, N.J.
Glassford, Donald Carson	Ch.E.,'35	Baltimore, Md.
Godfrey, Norman Maitland	Eng.,'37	Passaic, N.J.
Godshall, William Herbert	M.E.,'36	Lansdale
Goldsmith, John Joseph	Bus.,'36	Cleveland Heights, O.
Goldsmith, Poe Tennyson Longfellow	Eng.,'37	Catasauqua
Goldstein, Morris	Bus.,'35	New York, N.Y.
Gonzalez, Frank Aurelio	Bus.,'36	Brooklyn, N.Y.
Goodrich, George Edwards, Jr.	I.E.,'34	Bedford
Goodrich, Stanley Raymond	Bus.,'35	Belleville, N.J.
Gordon, Jack French	Bus.,'37	Slatington
Gordon, Robert Ransom, Jr.	Bus.,'34	Pittsburgh
Gormley, James Bernard	Arts,'37	Hazleton
Gortner, John William	M.E.,'35	Shamokin
Gotthardt, Charles Jackson	Bus.,'37	Bayonne, N.J.
Gould, Henry Sanford	Arts,'34	Albany, N.Y.
Graef, Herman Frederick	Met.,'34	Stapleton, N.Y.
Graeff, William Harm	Ch.E.,'35	Hershey
Grainger, Thomas Hutcheson, Jr.	Arts,'36	Allentown
Graw, Samuel Lazarus	Arts,'36	Hillside, N.J.
Gray, Thomas Douglas Lloyd	Bus.,'36	Marlborough, N.Y.
Greene, Herbert Floyd	Bus.,'37	Claysburg
Greene, John Van Rensselaer	Bus.,'37	Summit, N.J.
Greene, Thomas Frederick	I.E.,'34	Easton

Greiner, Henry Sandt	Chem.,'36	Bethlehem
Gretz, Clarence Burnley	Eng.,'37	Washington, D.C.
Grier, Garrett Layton	Bus.,'34	Milford, Del.
Griffith, Frank Phillip	Eng.,'37	Easton
Griffith, Joseph Donald	Eng.,'37	Johnstown
Groff, Frederick Augustus, Jr.	Arts,'35	Brooklyn, N.Y.
Grogan, George Davidson	Bus.,'35	Parkersburg, W.Va.
Gross, John Ellsworth	Bus.,'34	West Orange, N.J.
Gruhn, Henry Otto	Bus.,'34	Brooklyn, N.Y.
Grzybowicz, Leon Alfred	Arts,'34	Nanticoke
Gummere, William, Jr.	Ch.E.,'35	Trenton, N.J.
Guth, Hallet Willoughby	Eng.,'37	Wescosville
Guthrie, Edward Austin	E.E.,'35	Madison, N.J.
Guyer, Walter Richard Ferdinand	Chem.,'36	Allentown
Hackett, John Vincent	Bus.,'37	Riverton, N.J.
Hader, Michael	Arts,'35	Bethlehem
Hale, Robert Marsh	Arts,'37	Rockaway, N.J.
Hall, Robert Orrin	Eng.,'37	Providence, R.I.
Halliday, Norman Henry, Jr.	Arts,'37	Allentown
Hallow, William Charles, Jr.	Arts,'36	Dunmore
Halperin, Benjamin	Arts,'34	Pittsfield, Mass.
Hammer, Fred Robert	Bus.,'34	New Haven, Conn.
Hanna, Samuel James	Bus.,'34	Swarthmore
Hanson, Elwood Whittier	Ch.E.,'36	Stamford, Conn.
Hardcastle, Yellott Fitzhugh, Jr.	Eng.,'37	Philadelphia
Harding, William Cashmore	Met.,'36	East Orange, N.J.
Harkrader, Carl Ellison	Bus.,'37	Maplewood, N.J.
Harris, Daniel David	Bus.,'37	Newark, N.J.
Harris, Miles Lawson	Eng.,'37	Port Chester, N.Y.
Harris, Thomas Garde	Eng.,'37	Pen Argyl
Harris, William Thalheimer, Jr.	Bus.,'35	Allentown
Harrower, Wilbur Parkhurst	Bus.,'34	Plainfield, N.J.
Hart, Charles Willard	Eng.,'37	Frankfort, N.Y.
Hart, William Harmon	Bus.,'37	East Orange, N.J.
Hartman, Carl Robert	Bus.,'36	Lynnport
Hartmann, Theodore Frederick	Ch.E.,'36	Bethlehem
Harton, Vincent Edward Paul	I.E.,'34	Derby, Conn.
Hasler, Herman, Jr.	Bus.,'34	Caldwell, N.J.
Hauck, Elmer William	Ch.E.,'36	Englewood, N.J.
Haulenbeek, Garrie Beazley	Eng.,'37	Bound Brook, N.J.
Haulenbeek, Robert Bogle	Eng.,'37	Bound Brook, N.J.
Haupt, Harry Crickard, Jr.	Ch.E.,'34	York
Haverstick, Samuel Alexander	Eng.,'37	Carlisle
Hawk, Frank Carkhuff, Jr.	I.E.,'35	Bound Brook, N.J.
Hayman, Richard Homer	Ch.E.,'35	Racine, O.
Haynes, Edward MacPherson, Jr.	Bus.,'34	Skillman, N.J.

Healy, Dudley Loveland	E.E.,'36	Chatham, N.J.
Healy, Thomas Joseph	E.E.,'36	Bala-Cynwyd
Heath, Edwin Clifford	Eng.,'37	Bethlehem
Heether, Ernest Joseph	C.E.,'35	Williamsport
Heiberger, Charles Adam	Ch.E.,'35	Allentown
Heil, Richard Henry	Bus.,'37	Allentown
Heiney, John Weitzel	Bus.,'35	Oxford
Heller, Edward Lincoln	E.M.,'34	Palmerton
Heller, Ralph Schilling	Eng.,'37	Bethlehem
Helms, Samuel Britton	Ch.E.,'35	Philadelphia
Hemingway, Ellsworth Lowell	E.M.,'34	Bridgeport, Conn.
Hemphill, Wesley Lynn, II	Bus.,'36	Riverton, N.J.
Henderek, Frank Michael	Ch.E.,'36	Newark, N.J.
Hendey, Carl Nordell	Bus.,'37	Milford, Conn.
Hendrickson, William Frederick	Eng.,'37	Bronxville, N. Y.
Hennessy, John Andrew, Jr.	Arts,'37	Cherry Valley, Mass.
Henry, Eugene Howe	Bus.,'35	Ridgewood, N.J.
Hensinger, Carl Franklin	Arts,'36	Allentown
Hensinger, James Howard	Eng.,'37	Allentown
Hepp, Frederick Herman, Jr.	Bus.,'37	New York, N.Y.
Herbert, Sidney Pembroke	E.E.,'36	Upper Montclair, N.J.
Herman, Jack Paul	Arts,'35	Newark, N.J.
Herrick, Robert Ford	Arts,'34	Youngstown, O.
Hershkowitz, Edward	Arts,'37	New York, N.Y.
Herstine, John White	Bus.,'37	Bethlehem
Hertel, Charles Clement, Jr.	M.E.,'34	Ridgewood, N.J.
Hess, Francis Devereaux	Chem.,'36	Catasauqua
Hess, Thomas Dean	Eng.,'37	Mauch Chunk
Hickok, Daniel Hastings, Ph.B. *(Yale University)*	E.M.,'34	Harrisburg
Hicks, John Ryan	Bus.,'37	Mineola, N.Y.
Hidalgo, José Maria, Jr.	Eng.,'37	Havana, Cuba
Hildebrand, William Edward, Jr.	Arts,'37	Harrisburg
Hildenberger, Martin Joseph	E.E.,'36	Bethlehem
Hill, Harry Logan	C.E.,'34	Baltimore, Md.
Hill, Walter Warren	Eng.,'37	Washington, D.C.
Hillegas, Josiah Herman, Jr.	Bus.,'35	Forty Fort
Himsworth, Winston Edge	I.E.,'34	Flushing, N.Y.
Hinckley, Willard Becker, Jr.	Bus.,'36	Bath
Hinkle, Harold Eugene	E.M.,'34	Bethlehem
Hoar, Edgar Gordon	Bus.,'35	Ridgewood, N.J.
Hochgesang, Frank Prall	Eng.,'37	Hackettstown, N.J.
Hocker, Charles Richard	I.E.,'36	Bloomfield, N.J.
Hocking, John Girvin	Bus.,'37	Lancaster
Hodapp, Walter Leonard	Met.,'34	Maplewood, N.J.
Hoddinott, Wilbur Burton, Jr.	Arts,'36	Bethlehem
Hoffman, John Shimer	Eng.,'37	Easton
Hoffman, Wayne Crawford	Eng.,'37	Bernardsville, N.J.
Hoffmann, George Woodrow	M.E.,'36	Irvington, N.J.

Hofmann, Otto Frank	Eng.,'37	Melrose Park
Holbrook, Richard David	Eng.,'37	Washington, D.C.
Holler, Henry Greve	Bus.,'34	Forest Hills, N.Y.
Hollister, Charles Gurney	E.M.,'35	Trenton, N.J.
Hollister, Frank Joseph	E.E.,'35	Sea Cliff, N.Y.
Holme, Thomas Timings	M.E.,'35	Philadelphia
Holmes, Lawrence John, Jr.	I.E.,'34	Allentown
Holt, Reed Darlton	Bus.,'34	Pittsburgh
Holt, Robert Stewart	Bus.,'35	Pittsburgh
Hombis, Peter Paul	Eng.,'37	Bethlehem
Honeyman, Kenneth Louis	E.E.,'34	Somerville, N.J.
Hooper, Philip Lovel	Eng.,'37	Colver
Hopping, Richard Arundel	Arts,'35	Maplewood, N.J.
Hoppock, David Willard	I.E.,'36	Maplewood, N.J.
Horlacher, George Appel	Ch.E.,'35	Allentown
Horowitz, Irving	Bus.,'36	Brooklyn, N.Y.
Horowitz, Munroe	Arts,'34	New York, N.Y.
Hottenstein, John Mahlon	E.E.,'36	Allentown
Houck, John Deetz	Arts,'37	Scranton
Houston, Allan Frederick	E.E.,'36	River Forest, Ill.
Houston, James Homer	Bus.,'34	West Grove
Howells, Edgar Harris	Met.,'34	Johnstown
Howells, Frank Morgan	Eng.,'37	Johnstown
Howells, George Benjamin	Ch.E.,'34	Hanover
Hower, Edwin Neiman	Met.,'34	Lansdowne
Hoyt, Jack Garland	E.E.,'36	Berwick
Hoyt, Stuart MacNee	Bus.,'34	Pennington, N.J.
Hunkele, Herbert John, Jr.	Eng.,'37	South Orange, N.J.
Hunt, David Joseph	Bus.,'36	Grantwood, N.J.
Hutchinson, Herman Rumpp	Eng.,'37	Philadelphia
Hutchinson, William Seely, Jr.	Ch.E.,'36	Bethlehem
Hutt, Milton Howard	C.E.,'34	Egg Harbor City, N.J.
Hutton, Charles Wallace	Arts,'35	New Haven, Conn.
Hutton, Harold Lawton	Arts,'35	Pawtucket, R.I.
Huyck, James Horatio	Arts,'37	Dumont, N.J.
Hvass, Baldwin Charles	Bus.,'36	New York, N.Y.
Imbt, Herbert Richard, Jr.	Eng.,'37	Stroudsburg
Issel, William Ernest	Bus.,'34	Philadelphia
Ives, Delano Redfern	Bus.,'37	Elizabeth, N.J.
Ivins, Daniel Foster, Jr.	Bus.,'35	Trenton, N.J.
Jackson, Melvin Leslie	Eng.,'37	Philadelphia
Jackson, Robert Bickley	Bus.,'35	Drexel Hill
Jackson, Walter William	Bus.,'35	Ridgewood, N.J.
Jacobi, Karl Moore	Eng.,'37	Bayonne, N.J.
Jacobi, Walter Munhall	Bus.,'34	Bayonne, N.J.
Jacobs, John Henry	Bus.,'35	Hazleton
James, Paul Meyer	Phys.,'35	Reading
Jamison, Robert Stuart	Bus.,'37	Greensburg
Jauck, Walter Milton	Eng.,'37	Woodhaven, N.Y.
Jester, John Milton, Jr.	Chem.,'36	Washington, D.C.

Jobbins, James Edward	Arts,'34	Jenkintown
Johnson, Wallace Claybourne	Bus.,'37	Southwick, Mass.
Johnson, William Austin	Met.,'35	Washington, D.C.
Johnston, Drew Spamer	Arts,'34	Philadelphia,
Johnston, William Hartley	Eng.,'37	North Wales
Jones, Cary Bodley	E.E.,'34	Kirkwood, Mo.
Jones, Harrison Morton, Jr.	Arts,'37	N. Tonawanda, N.Y.
Jordan, Thomas Benjamin	Bus.,'34	South Orange, N.J.
Juer, Robert	Eng.,'37	Hopewell, Va.
Julius, William Robison, Jr.	Bus.,'37	Brooklyn, N.Y.
Kaesemeyer, Charles Cassard	I.E.,'36	Hazleton
Kain, Royal Christopher	I.E.,'34	Prince Bay, N.Y.
Kalb, George Herbert	Ch.E.,'36	Altoona
Kampshulte, Robert Henry	Ch.E.,'35	Farmingdale, N.Y.
Kearney, Joseph Aloysius	Eng.,'37	Grantwood, N.J.
Keim, Charles, Jr.	M.E.,'35	Pottsville
Keller, Alfred William	Bus.,'34	Summit, N.J.
Kellstedt, Paul Arthur	Arts,'37	Gaylordsville, Conn.
Kemmer, Robert Allison	Ch.E.,'36	Larchmont, N.Y.
Kendall, Gordon Hodgkins	Eng.,'37	Chevy Chase, Md.
Kennedy, Frank Stewart	C.E.,'34	Llanerch
Kennedy, Henry Clay, Jr.	Eng.,'37	Harrisburg
Kennedy, Kenneth Kingman	Eng.,'37	Easton
Kidd, Robert William, Jr.	Eng.,'37	Penns Grove, N.J.
Kight, John Wesley	I.E.,'34	New York, N.Y.
Kildare, Vernon Albert	Eng.,'37	Bethlehem
Kildebo, Howard Martin	M.E.,'35	Hazleton
Kilpatrick, Howard Frederick	Bus.,'34	South Orange, N.J.
Kimball, William Brice	Bus.,'37	Philadelphia
King, Donald Milton	M.E.,'35	Norristown
Kins, Richard Jacob	Arts,'37	Allentown
Kinsinger, Walter Willis	E.E.,'34	Harrisburg
Kirk, Edwin Countryman	M.E.,'36	Troy, N.Y.
Kirkpatrick, Littleton, Jr.	Bus.,'37	Wilmington, Del.
Klatzkin, Charles	Bus.,'34	Johnstown
Klausmann, Milton Harry	I.E.,'35	Maplewood, N.J.
Klein, Irving Thompson	Bus.,'37	Rosebank, N.Y.
Kleinhans, John Ashmore	Eng.,'37	Easton
Kleinman, Isaac Ernest	Arts.,'34	Newark, N.J.
Kleppinger, Clayton Thomas	Ch.E.,'36	Allentown
Klingaman, Lloyd Kistler	Eng.,'37	Emaus
Knauss, Albert Roland	E.E.,'36	Nazareth
Knipe, Vincent Arthur	Arts,'35	Bethlehem
Kohler, Stanley Maurice	C.E.,'36	Bloomfield, N.J.
Koller, Howard	Eng.,'37	Bethlehem
Koman, Michael	Ch.E.,'35	Fogelsville
Konolige, George Charles, Jr.	Bus.,'34	Bethlehem
Koondel, Jack William	Bus.,'34	Brooklyn, N.Y.
Koranye, Theodore Deziderius	Phys.,'35	Babylon, N.Y.
Korn, Willard Charles	Bus.,'34	Irvington, N.J.
Kornet, John Leonard	Ch.E.,'36	Wortendyke, N.J.

Kornfield, Norman Bernard	Arts,'35	Kearny, N.J.
Kotanchik, Nicholas Walter	E.M.,'34	Ranshaw
Kozak, Walter Harry	Eng.,'37	Shamokin
Kraemer, John Jacob	Eng.,'37	Pottsville
Krapf, Frank Metzger	Eng.,'37	Trenton, N.J.
Krasner, Sanford	Bus.,'34	Newark, N.J.
Krauter, Harold Seibel	Eng.,'37	Shillington
Kreller, Max Arno	Eng.,'37	Narrowsburg, N.Y.
Kress, Jackson Edmund	Arts,'35	Pen Argyl
Kress, John Harner	I.E.,'36	Pittsburgh
Krisher, William Stanley	Bus.,'35	Philadelphia
Krupinski, Francis Thomas	Arts,'37	Mahwah, N.J.
Krupp, Edgar Carl	Arts,'37	Brooklyn, N.Y.
Krusius, Ewald Henry	Ch.E.,'35	Weehawken, N.J.
Kuhl, Carl Walter, II	Eng.,'37	White Plains, N.Y.
Kuhl, Frederick August	Eng.,'37	Allentown
Kuhl, William Frederick, Jr.	Bus.,'36	Allentown
Kuhns, Charles Henry	Arts,'36	Allentown
Kurtz, Milton David	Bus.,'36	Trenton, N.J.
Lake, Leonard Michael	Bus.,'36	Mount Vernon, N.Y.
Lake, Simon, III	Arts,'37	Milford, Conn.
Lambert, Fred	Bus.,'34	Maplewood N.J.
Lambert, John Stuart	Bus.,'37	Bethlehem
Land, Edward Herbert	Arts,'36	Brooklyn, N.Y.
Landis, Given Arnold	Met.,'34	Bethlehem
Langdon, Palmer Hull, Jr.	Arts,'36	Brooklyn, N.Y.
Langer, Henry Charles, Jr.	Bus.,'36	Hasbrouck Heights, N.J.
Lannan, Louis Edgar Jr.	Ch.E.,'36	McKeesport
Lark, Frederick Emanuel	Arts,'34	Shamokin
Larsen, Arnold Leo	Bus.,'34	South Orange, N.J.
Larson, Justus	Met.,'34	Lynden, Wash.
Lauer, Franklin Richard	Bus.,'36	Lansford
Lawlar, John Bavaird	Ch.E.,'35	Chester
Lawton, Irving Lester	Bus.,'37	Olcott, N.Y.
Layman, Ralph Earl, Jr.	Ch.E.,'35	Red Bank, N.J.
Leach, Orin Tuck	Bus.,'34	Red Bank, N.J.
Lease, Austin Jay	Eng.,'37	Bethlehem
Lee, Gregory Christie	Eng.,'37	Paterson, N.J.
Lee, Robert Edward	Eng.,'37	White Plains, N.Y.
Leland, Carl Baum	Arts,'37	Hamilton, N.Y.
Lengel, Robert Charles	Met.,'34	Bryn Mawr
Lenna, Reginald Alexander	I.E.,'36	Jamestown, N.Y.
Leonard, Nelson Jordan	Eng.,'37	Mount Vernon, N.Y.
Levenson, Harold Samuel	Eng.,'37	Allentown
Levin, Lawrence William	Bus.,'34	Port Jervis, N.Y.
Levy, Jerome Louis	Arts,'37	Trenton, N.J.
Lewis, Clay Edward, III	Eng.,'37	York
Lewis, Robert Frederick	Bus.,'37	Lansford
Liggett, Frank Rahm, Jr.	Arts,'34	Bethlehem
Liggett, Thomas, III	Ch.E.,'34	Jenkintown

Lincoln, Edwin Marsden	Bus.,'37	New Haven, Conn.
Lincoln, William McDowell	Bus.,'37	Philadelphia
Lindabury, Richard Nicholas	Chem.,'34	Burlington, N.J.
Lindenhayn, Rolf, Jr.	Ch.E.,'36	Ridgewood, N.J.
Link, Gordon Peter	Met.,'36	Schenectady, N.Y.
Linsenmeyer, John Zimmermann	Eng.,'37	Philadelphia
Linton, Thomas, B.A. *(Amherst College)*	E.M.,'34	Palmerton
Lippard, Robert Frost	Bus.,'35	Buffalo, N.Y.
Lippe, Vincent Stuyvesant, Jr.	Arts,'37	New York, N.Y.
Lisle, John	Chem.,'36	Paoli
List, Alexander Frederick	Bus.,'35	Maplewood N.J.
Lloyd, Elbert Stevens	Bus.,'34	Wilkes-Barre
Loizeaux, Samuel Rutherford	Eng.,'37	Towson, Md.
London, Russell Isaiah	Arts,'35	Philadelphia
Long, Austin Kunsman	Ch.E.,'34	Freemansburg
Longo, Albert Francis	Arts,'37	Bethlehem
Lord, Richard Marston	Eng.,'37	Mount Vernon, N.Y.
Lore, Henry Edgar	M.E.,'35	Atlantic City, N.J.
Lore, Morris Byron	Eng.,'37	Atlantic City, N.J.
Lorenzo, Manuel DePerez	Arts,'36	Bethlehem
Lotz, William Frederick, Jr.	C.E.,'36	Philadelphia
Loughran, Patrick Henry	C.E.,'34	Washington, D.C.
Loux, Arthur Henry	Bus.,'36	Newark, N.J.
Lovett, Albert Burbank	Met.,'36	East Orange, N.J.
Lowright, Raymond Charles	Bus.,'37	Bethlehem
Lubbers, Adolph William	E.E.,'34	Baltimore, Md.
Lueders, Charles Williamson	Met.,'35	Bala-Cynwyd
Lutz, Curwen William	Ch.E.,'35	Perkasie
Lynch, William Arthur	Bus.,'37	Allentown
Macdonald, William Henry, Jr.	I.E.,'35	Passaic, N.J.
MacGuffie, James	Ch.E.,'34	Orange, N.J.
MacLetchie, John Graham	Bus.,'36	Old Greenwich, Conn.
MacPhee, Joseph Hugh	Bus.,'34	Arlington, Mass.
Male, John Medland	I.E.,'36	Brooklyn, N.Y.
Malinowski, Francis Xavier	I.E.,'35	Harrisburg
Mallalieu, Frank Rodeback, Jr.	Phys.,'36	Oxford
Mancke, Edgar Bell	Ch.E.,'36	Bethlehem
Manheimer, Sanford Hirsh	M.E.,'36	Lancaster
Manos, Teddy Michael	I.E.,'35	Greensburg
Manson, George Douglas	Bus.,'35	Red Bank, N.J.
Mant, Robert Warnock	Bus.,'35	Arlington, N.J.
Mapes, Charles Maynard, Jr.	Bus.,'37	Rutherford, N.J.
Mapes, Winfield Harvey, Jr.	Eng.,'37	Glen Ridge, N.J.
Maratta, William Zimmerly	E.M.,'35	Coraopolis
Marcovitz, Isadore Israel	I.E.,'36	Philadelphia
Marks, Bennett Joseph	Arts,'36	Brooklyn, N.Y.

Marks, Robert Edwin	Ch.E.,'35	Allentown
Marshall, Erwin Ellsworth, Jr.	Arts,'34	Trenton, N.J.
Martin, Harry Charles Coakley	Ch.E.,'34	Glen Rock, N.J.
Martin, William Stockton, Jr.	Bus.,'36	Stratford, N.J.
Marty, Carl Sherman, M.E. *(University of Michigan)*	E.M.,'34	Pottsville
Marx, Halvey Edward	Arts,'37	Queens Village, N.Y.
Masiko, Peter, Jr.	Arts,'36	Allentown
Matesky, Solomon Joseph	Ch.E.,'34	Bethlehem
Mathers, Joseph Willis	E.E.,'36	Brookline
Mathias, Winston Kent	Eng.,'37	Waynesboro
Matthews, John Hanson	Bus.,'35	Newark, N.J.
Mayer, Victor	Arts,'34	Brooklyn, N.Y.
Maynard, William Benz	I.E.,'35	Paterson, N.J.
Mayshark, James Page	Eng.,'37	Chatham, N.J.
McArdle, John James	Arts,'35	Havana, Cuba
McBane, Alan Hubert	E.M.,'34	Aliquippa
McCaa, William Donald	Bus.,'36	Bethlehem
McCabe, Joseph Charles	E.E.,'36	Plainfield, N.J.
McCarty, Charles Allen	Arts,'35	Bethlehem
McClintic, Richard Ridge	C.E.,'35	Pittsburgh
McCollum, William, Jr.	Bus.,'37	Rahway, N.J.
McComb, John Russell	Arts,'36	Rockville Center, N.Y.
McConnell, John Henry	Met.,'34	Youngstown, O.
McCoy, Charles Frederick, Jr.	Arts,'37	Pennington, N.J.
McCoy, Warren Thomas	Arts,'37	Shillington
McDaniel, Joseph Stites	Bus.,'34	Dover, Del.
McDonald, Franklin Joseph	Arts,'37	Scranton
McGinley, Edward Eugene	Met.,'35	Allentown
McIlhiney, William Gamble	Eng.,'37	Madison, N.J.
McIlwraith, Arthur Kenneth	Arts,'34	Ridgewood, N.J.
McKaig, Albert Stuart, Jr.	Eng.,'37	Wilmington, Del.
McKay, John Earl	Eng.,'37	Catasauqua
McKeone, Charles Joseph	Bus.,'35	Allentown
McKinney, Frank William	Arts,'36	Bethlehem
McLeod, Richard Earl	I.E.,'34	Rutherford, N.J.
McMeans, George Beale	Met.,'35	Tarentum
McNair, Edwin Gunn, Jr.	Bus.,'37	Pittsburgh
McNally, Harry John	Eng.,'37	Philadelphia
Meihofer, Anthony Rudolph	C.E.,'36	Allentown
Meiselman, Harold Engel	Arts,'35	New York, N.Y.
Meissner, Milton	Chem.,'34	Plainfield, N.J.
Meixell, Milo Daniel	C.E.,'34	Nazareth
Merritt, George Jester	Ch.E.,'35	Wilmington, Del.
Mertens, Fred Meharg	M.E.,'34	Asbury Park, N.J.
Messmore, Isaac Lindsey	Arts,'36	Masontown
Metz, Elwood Cawley	C.E.,'34	Nazareth

Metz, Ralph Ziegler	Bus.,'35	Nazareth
Meyer, Albert Henry	Bus.,'36	Jersey City, N.J.
Michaelson, Stanley Day	E.M.,'34	Brooklyn, N.Y.
Miller, Clinton Fred	Chem.,'34	Berwick
Miller, David Hiltz	Eng.,'37	Mauch Chunk
Miller, Edgar Gilpin	Arts,'35	Easton
Miller, Frank Bott, Jr.	Bus.,'35	Greensburg
Miller, Harold Yach	Ch.E.,'34	Lyndhurst, N.J.
Miller, Robert Frantz	M.E.,'36	Lancaster
Miller, Robert George Lenhart	Bus.,'37	Hamburg
Miller, Walter Samuel	Ch.E.,'34	California
Milliken, Thomas Henry	Ch.E.,'35	Pittsburgh
Mills, Ivor William	Chem.,'35	Wyoming
Miner, Robert Bodley, Jr.	Eng.,'37	Madison, N.J.
Minskoff, Henry Harold	Bus.,'34	New York, N.Y.
Minskoff, Jerome	Bus.,'36	New York, N.Y.
Mock, Frank Day	Eng.,'37	Montclair, N.J.
Moffett, Robert Nelson	C.E.,'34	Coatesville
Mollenauer, William Emery	I.E.,'35	Canonsburg
Moore, Charles Atwell	Eng.,'37	Scarsdale, N.Y.
Moore, Robert Hawkesworth	Bus.,'37	Pleasantville, N.Y.
Morgan, Charles Edmund, Jr.	Met.,'34	Old Greenwich, Conn.
Morgan, Frank Benedict	E.E.,'35	Dunmore
Morris, Arnold	Arts,'36	Brooklyn, N.Y.
Morrison, Arthur Victor	Ch.E.,'36	Ridgefield Park, N.J.
Morrison, George Ronald	Ch.E.,'36	Minersville
Morrow, Andrew Stanley, Jr.	Eng.,'37	Easton
Morse, John Alfred	Ch.E.,'34	Scranton
Mount, Edward Hunt	Eng.,'37	Freehold, N.J.
Moyer, Charles C., Jr.	Bus.,'36	Allentown
Mozes, Adolph	I.E.,'34	Allentown
Mueller, John Egon	C.E.,'34	Baldwin, N.Y.
Muir, Malcolm Stabler	Arts,'35	Williamsport
Murphy, John Hankinson	Chem.,'35	New York, N.Y.
Musselman, Casper Rosenstock	Ch.E.,'36	Bethlehem
Musselman, Richard Thomas	Eng.,'37	Bethlehem
Musser, Shelton Arthur	C.E.,'35	Reading, Pa.
Myers, Benjamin Herman	Bus.,'34	Salem, Mass.
Napravnik, August	Eng.,'37	Freemansburg
Neely, John de Monte	Arts,'35	Latrobe
Neiman, Charles Herman	M.E.,'35	York
Neiman, Paul Ebler	Ch.E.,'36	Philadelphia
Neiman, William Robert	Bus.,'35	Philadelphia
Nelson, Arthur Ferdinand, Jr.	I.E.,'34	Harrisburg
Newman, Stanley Henry	Eng.,'37	Newark, N.J.
Nichols, Edson Hoyt, Jr.	Eng.,'37	Hackensack, N.J.
Nickerson, Philip Gurney	I.E.,'34	Pittsburgh
Niehaus, Thomas Edward	Bus.,'37	East Orange, N.J.
Nilan, John Joseph, Jr.	C.E.,'35	Bergenfield, N.J.
Nissley, Samuel Brandt	M.E.,'35	Salunga

Nivin, David Traver	Ch.E.,'34	Bethlehem
Noecker, Therman Clifford	E.E.,'34	Shoemakersville
Nolfi, Emil Leo	E.M.,'34	Glen Lyon
Nordt, William Faust	Ch.E.,'36	Newark, N.J.
Nutt, Walter Frederick, Jr.	Eng.,'37	Clifton, N.J.
O'Brien, Harry Joseph, Jr.	Bus.,'34	Deal, N.J.
O'Brien, Thomas Joseph	Eng.,'37	Bala-Cynwyd
Ock, Harold David	Bus.,'36	Brooklyn, N.Y.
Ohmer, Paul Herman	M.E.,'36	Ridgewood, N.J.
Okuno, Clifford Kaiei	Chem.,'34	Delaware Water Gap
Oller, José Antonio	Arts,'37	Brooklyn, N.Y.
Olofson, Carl Theodore	Ch.E.'35	West Orange, N.J.
Olofson, Earl Clifford	M.E.,'35	West Orange, N.J.
Olwine, Richard Eyrich	Bus.,'34	Perth Amboy, N.J.
Opie, John Vredenburg	Ch.E.,'35	Neshanic, N.J.
Oppenheimer, Edward Gray	Bus.,'37	Pittsburgh
Orr, George Pownall, Jr.	Eng.,'37	Berwyn
Oskin, William Walker	C.E.,'36	Bethlehem
Osman, Albert Edward	Phys.,'35	Bridgeport, Conn.
Osterhoudt, Lawrence Jan	C.E.,'36	New Paltz, N.Y.
Osterstock, Louis Henry	Bus.,'35	Irvington, N.J.
Palestine, Victor	Arts,'37	Mount Vernon, N.Y.
Palmer, Parker	Arts,'37	Bethlehem
Pangburn, Robert Arthur	Phys.,'34	Oneonta, N.Y.
Parassio, Anthony Vincent	M.E.,'35	Camden, N.J.
Parish, Richard Wagner	Eng.,'37	Philadelphia
Parker, Albert Ransom, Jr.	Eng.,'37	Gloucester, Mass.
Parrish, Frank Collins	Bus.,'36	Ridgewood, N.J.
Parsons, Herbert Heitzheimer	Eng.,'37	Palmyra, N.J.
Parsons, Joseph Hiram	Eng.,'37	Stroudsburg
Parthemore, Philip Mark, Jr.	Arts,'37	Harrisburg
Partridge, Seymour Truman	M.E.,'35	Northville, N.Y.
Patella, Armand Major	Arts,'36	Brooklyn, N.Y.
Paternoster, Joseph Albert	C.E.,'34	Trenton, N.J.
Paterson, Gordon Wilson	Bus.,'34	Arlington, N.J.
Patten, Alex Stevens	Ch.E.,'35	Ridgewood, N.J.
Pavelko, Joseph Stephen	Bus.,'37	Ellsworth
Pazzetti, Vincent Joseph, III	Bus.,'37	Bethlehem
Pearson, Philip Dawson	E.M.,'36	Wilkes-Barre
Pease, Robert Horton	Bus.,'34	Rochester, N.Y.
Peck, Hubert Dalton	Eng.,'37	Old Greenwich, Conn.
Peck, Marcel Kahle	Bus.,'35	Charleston, W.Va.
Pedrick, William Warren, III	Eng.,'37	Millville, N.J.
Peet, Knox Laughlin	Bus.,'37	Utica, N.Y.
Pelizzoni, Winton John	M.E.,'34	Allentown
Pennauchi, Louis Ralph	Arts,'37	Burlington, N.J.
Pennington, Fred Alexander	Ch.E.,'36	Montoursville
Peraino, Joseph John	E.M.,'36	Ridgewood, N.J.
Perkins, James Hill	Eng.,'37	Langhorne
Perrine, Robert Hutchinson	I.E.,'36	Bloomfield, N.J.
Peters, Carl Brooks	Arts,'34	New York, N.Y.

Peterson, Walter Albert	Bus.,'34	Summit, N.J.
Pettibone, Raymond Shelton	Eng.,'37	Island Heights, N.J.
Pfaff, Henry Carl, Jr.	Chem.,'35	East Orange, N.J.
Pharo, Charles Budd, Jr.	Bus.,'35	Trenton, N.J.
Phillips, Allen Wentworth	Eng.,'37	Washington, D.C.
Phillips, Andrew Nesbitt	Bus.,'35	Morristown, N.J.
Pickell, Clement Charles	I.E.,'35	Flushing, N.Y.
Picking, Robert Boyd	Arts,'36	Somerset
Pidus, Theodore Peter	Arts,'37	Bethlehem
Pierson, Frank Kenneth	M.E.,'36	Washington, D.C.
Piper, John Arthur	Arts,'36	South Orange, N.J.
Pisarev, David Connells	Ch.E.,'34	Bethlehem
Pitcairn, Alexander	Bus.,'36	Pittsburgh
Pittenger, Frank Mott	Bus.,'34	Bethlehem
Plewes, David Stanley	Eng.,'37	Jenkintown Manor
Plumb, Walter Timms	Bus.,'34	Elizabeth, N.J.
Podeyn, George John, Jr.	Eng.,'37	Bayside, N.Y.
Podgursky. John Michael	Eng.,'37	Bethlehem
Polk, Cletus Vincent	Arts,'36	Port Washington, N.Y
Porazzi, Michael Clement	Arts,'37	Bethlehem
Porter, Robert Shelly	E.E.,'34	East Northfield, Mass.
Porter, Waldo, Jr.	E.E.,'36	Greensboro, N.C.
Potochney, Peter John	Arts,'37	Freeland
Potter, Charles Beattie	Arts,'36	Washington, D.C.
Powell, George Farabaugh	Bus.,'36	Altoona
Prall, Robert Claude	Arts,'36	Brooklyn, N.Y.
Pratt, Thomas Willard	Ch.E.,'36	Jersey City, N.J.
Preston, Paul Franklin	Ch.E.,'35	Bethlehem
Price, Henry Embleton	Arts,'34	Sayre
Prior, Joseph Eli	Met.,'34	Bayonne, N.J.
Prosnit, Daniel Robert	Bus.,'36	New York, N.Y.
Provost, Richard Whitehead	M.E.,'36	Caldwell, N.J.
Prowell, Roy Walters	I.E.,'36	Steelton
Puffer, Hal Everest	Bus.,'36	Buffalo, N.Y.
Purdy, George William	Bus.,'34	Englewood, N.J.
Purnell, Forest Clarence James	C.E.,'35	Pottstown
Putnam, Kent Sayre	Arts,'35	Bethlehem
Quackenbush, Cornelius Bogert	C.E.,'36	Hackensack, N.J.
Quinn, Joseph Aloysius	E.E.,'34	Pittston
Quinn, Thomas Stephen	Arts,'36	Bethlehem
Rachlin, Albert Cyrus	Bus.,'36	Newark, N.J.
Radding, Jason David	Arts,'34	Mount Vernon, N.Y.
Rae, Morton Black	Bus.,'35	West Newton, Mass.
Raff, John Lloyd, Jr.	Eng.,'37	Philadelphia
Ramsay, Robert Cooper	Ch.E.,'36	Reading
Ramsey, Lloyd Albert	Eng.,'37	York
Rand, Vandervoort	Bus.,'35	North Tonawanda, N.Y.
Raring, Linus Michael	Met.,'34	Harrisburg

Raring, Richard Holland	Met.,'36	Harrisburg
Ratway, Joseph	Eng.,'37	Shaft
Rau, William Jamison	Ch.E.,'36	Bethlehem
Rawitz, Sidney Benjamin	Arts,'37	Newark, N.J.
Reabuck, Roy Arthur	Arts,'34	Forty Fort
Redcay, James Elias	Eng.,'37	Reading
Redfern, Ira Paul	Eng.,'37	South Orange, N.J.
Reed, Ericson	I.E.,'35	Washington
Reed, Malcolm Clarence	Eng.,'37	Dunkirk, N.Y.
Reed, Nelson Gibbs	Eng.,'37	Dalton, Mass.
Reid, George Lee	Eng.,'37	Pottsville
Reider, Thomas Franklin	Eng.,'37	Schuylkill Haven
Reidy, Hamil	Bus.,'36	New York, N.Y.
Reifsnyder, Robert Wells	Eng.,'37	Jamaica, N.Y.
Reilley, James Michael	Eng.,'37	Centralia
Reinitz, Jerome Leon	Arts,'37	Brooklyn, N.Y.
Reis, Robert	Arts,'36	New York, N.Y.
Renard, Walter Ashton	Eng.,'37	Great Neck, N.Y.
Replogle, Charles Nathan, Jr.	Arts,'35	Johnstown
Resnikoff, Max Edward	Arts,'36	Brooklyn, N.Y.
Retzer, William Raymond	Ch.E.,'34	Deposit, N.Y.
Reul, Raymond Insel	Ch.E.,'35	Roselle, N.J.
Reynolds, Vincent William	Bus.,'35	Balboa, Canal Zone
Rice, Robert Cyriax	Eng.,'37	Glen Rock, N.J.
Rich, Adin Partridge, Jr.	I.E.,'36	Buffalo, N.Y.
Richardson, Franklin William	Ch.E.,'36	Flushing, N.Y.
Richter, Frederick Kingdon	I.E.,'34	Selinsgrove
Rick, Richard	M.E.,'35	Reading
Ridge, William Francis, Jr.	E.E.,'34	Tamaqua
Riedell, Wallace Calhoun	Eng.,'37	Garden City, N.Y.
Riley, Reginald LaDow	Bus.,'35	Port Norris, N.J.
Riley, Robert Hickman, Jr.	E.E.,'35	Catonsville, Md.
Riley, Robert Leinbach	I.E.,'34	Woodcliff, N.J.
Rimmer, Donald Cyril	C.E.,'36	Philadelphia
Ring, William Edward	Bus.,'37	New Haven, Conn.
Riss, Gustav Anton	M.E.,'36	Cleveland, O.
Rista, Ezio Rudolph	Eng.,'37	Haledon, N.J.
Riter, Emil Robert, Jr.	Eng.,'37	Narberth
Ritter, Ernest Frederick, Jr.	Arts,'34	Allentown
Ritter, Ferman Thomas	E.E.,'35	Easton
Ritter, Francis Charles	Arts,'37	Allentown
Robbins, Leonard Edmund	Bus.,'35	Millville, N.J.
Roberts, Lewis, Jr.	Bus.,'36	Fairfield, Conn.
Roberts, Paul Taylor	I.E.,'36	Westfield, N.J.
Roberts, William Hugh	Bus.,'36	Swarthmore
Robinson, Kenneth Balch	Eng.,'37	Endicott, N.Y.
Robinson, Neil	Eng.,'37	Ward, W.Va.
Robinson, William Allan, B.S. *(Washington College)*	C.E.,'34	Chestertown, Md.
Rock, George Washington	Arts,'37	Brooklyn, N.Y.
Rodgers, Jay Tongate	Bus.,'36	South Orange, N.J.

Roenke, Gardner Julius	Bus.,'37	Geneva, N.Y.
Rogers, George Klemm	Eng.,'37	Haverford
Rogers, Gilbert Dwight	Met.,'36	Big Stone Gap, Va.
Rogers, Wayne Carlton	M.E.,'36	Kingston
Root, Benjamin Mylin	I.E.,'35	York
Roper, Charles Garland	Phys.,'35	Petersburg, Va.
Roper, John Nathaniel, Jr.	Ch.E.,'34	Petersburg, Va.
Rosebery, Hugh John	M.E.,'36	West Haven, Conn.
Rosenheim, Morton Adolf	Arts,'35	Brooklyn, N.Y.
Rossetti, Joseph	Bus.,'37	Allentown
Roth, William Franklyn	Arts,'36	Coopersburg
Rowland, Lindsay	Arts,'34	Freeland
Rozell, Albert Fellows	Eng.,'37	Croton-on-Hudson,N.Y.
Ruffle, Leslie	E.E.,'36	Queen's Village, N.Y.
Russell, George Burton	I.E.,'36	East Hampton, N.Y.
Rust, Stirling Murray, Jr.	M.E.,'34	Pittsburgh
Rust, William Fitzhugh, Jr.	E.E.,'36	Leesburg, Va.
Ruth, George Clifford	Bus.,'34	Maplewood, N.J.
Sachs, Richard Hugo, Jr.	Bus.,'37	Nutley, N.J.
Sadtler, Philip	Chem.,'34	Philadelphia
Salmon, Robert Macdonald	Bus.,'36	Maplewood, N.J.
Samuel, Howard Bross	Eng.,'37	Hackettstown, N.J.
Samuels, David Griffith, Jr.	E.M.,'36	Bethlehem
Sandercock, Charles Hulbert	Arts,'36	Scranton
Sandwick, Charles Martin	Arts,'34	Elmira Heights, N.Y.
Sasse, Ralph Warren	Bus.,'36	New York, N.Y.
Saunders, Robert Lee, Jr.	Eng.,'37	Irvington, N.J.
Savage, Walter Benjamin	Bus.,'37	Cape May, N.J.
Savastio, James Dominic	C.E.,'35	Hershey
Sawyer, Edwin Albert	Bus.,'35	Bethlehem
Saxman, Edwin Forrest	Eng.,'37	Somerset
Saxman, John Brooke	Arts,'36	Somerset
Saxtan, George Taylor	Bus.,'36	Jersey City, N.J.
Sayer, William Hallock, Jr.	Eng.,'37	Warwick, N.Y.
Scanlon, John Henry	Arts,'37	Bethlehem
Schaeffer, Judson	Arts,'36	Bethlehem
Schaffer, Edward David	Arts,'37	Bath
Schaffer, Elwood Joseph	Ch.E.,'34	Bath
Schappel, Joseph William	Ch.E.,'35	Allentown
Schatz, Robert James	Ch.E.,'36	Allentown
Schaub, Charles Emmet	Arts,'34	Freeland
Scheer, Herman Carl	Eng.,'37	Stroudsburg
Schell, August Henry, Jr.	Eng.,'37	Philadelphia
Schenk, Everett Milford	M.E.,'36	Summit, N.J.
Scher, Jerome Norman	Bus.,'36	Newark, N.J.
Scheuermann, Hugo Paul	Eng.,'37	Montclair, N.J.
Schick, Leonard Hubert	Arts,'37	Bethlehem
Schifter, Erich Stephan	Eng.,'37	South Ardmore
Schlenker, Henry Walter, Jr.	Ch.E.,'36	Elizabeth, N.J.
Schmid, Francis Rauch, Jr.	Eng.,'37	Tarrytown, N.Y.
Schmoyer, Frederick Peter	C.E.,'36	Allentown

Schmoyer, Richard Lawrence	Eng.,'37	Allentown
Schnabel, William Lewis	Eng.,'37	Pittsburgh
Scholl, Harold Nevin	Ch.E.,'34	Souderton
Scholla, Paul Frederick	E.M.,'35	Dunmore
Schrader, Elwood	Bus.,'37	Allentown
Schubert, Charles Robert	Eng.,'37	Douglaston. N.Y.
Schuyler, Alfred McLaughlin	Eng.,'37	Middletown, N.Y.
Schwartz, Leslie Ralph	Bus.,'37	Cedarhurst, N.Y.
Schwartz, Robert Wilmot	Arts,'35	Harrisburg
Schwarz, Sidney May	Bus.,'35	Dover, N.J.
Schwarzkopf, Albert Beauregard, Jr.	Eng.,'37	Norfolk, Va.
Schwarzwaelder, LeRoy	Ch.E.,'36	Maplewood, N.J.
Scobey, Howell Alexander, Jr.	M.E.,'36	Neptune City, N.J.
Scott, David Morris, Jr.	Eng.,'37	East Orange, N.J.
Seeley, Howard Wilson, Jr.	C.E.,'35	Ridgewood, N.J.
Settle, Paul Smith, Jr.	C.E.,'36	Drexel Hill
Seybold, Arthur Mack	Eng.,'37	Elkins Park
Shackford, Charles Chauncey	E.E.,'35	Jamestown, R.I.
Shafer, David Woodrow	I.E.,'34	Bethlehem
Shafer, Jack Daniel	Eng.,'37	Hanover
Shafer, Montgomery Rea, Jr.	E.E.,'36	Chevy Chase, Md.
Shafer, Russell Morey	Eng.,'37	Hanover
Shank, William Haldeman	Eng.,'37	Camp Hill
Sharpe, Fred Lawrence	I.E.,'36	Ridgefield Park, N.J.
Shear, Thomas Ridpath	Eng.,'37	Coudersport
Shepard, Harvey Mortimer	Eng.,'37	Madison, N.J.
Sheridan, Clement Bare, Jr.	Arts,'37	Bethlehem
Sherlock, Furman John	Arts,'37	Collingswood, N.J.
Sherrill, Clarence Caldwell	Bus.,'35	Cincinnati, O.
Shimer, Acton Jerome	E.E.,'34	Bethlehem
Shinn, Garrett Hance	E.E.,'36	Palmerton
Shipp, Harry Benedict	C.E.,'35	Bethlehem
Shivo, Louis E.	Bus.,'37	Hazleton
Shoemaker, William Grow, Jr.	Eng.,'37	Norristown
Sholly, Henry Levan	Arts,'35	Wilmington, Del.
Short, Paul Edward	Bus.,'34	Belleville, N.J.
Siegel, Henry Auerbach	Bus.,'37	New York, N.Y.
Siegel, William George	Arts,'36	New York, N.Y.
Silberberg, Leonard	Bus.,'37	Brooklyn, N.Y.
Silimperi, Pasquale	Ch.E.,'34	Bethlehem
Silvasi, John Joseph	Arts,'37	Freeland
Silverberg, Nathan	Arts,'35	Bethlehem
Silverstein, Harold	Arts,'34	Philadelphia
Silverstein, Jack Samuel	Arts,'37	Trenton, N.J.
Simmons, Frank Gordon	Eng.,'37	Nutley, N.J.
Simpson, Herbert Sydney	Arts,'36	Brooklyn, N.Y.
Simpson, Richard William	M.E.,'36	Waterbury, Conn.
Sine, Aubrey Bernard, Jr.	Bus.,'35	Trenton, N.J.
Sittler, Paul Mertz	I.E.,'34	Kutztown
Skedgell, Ralph Erving	Bus.,'36	Millville, N.J.

Slingerland, Edward Gilman	Bus.,'34	Millburn, N.J.
Sloan, Kenneth Cooper	Eng.,'37	Murrysville
Sloan, Robert Otis	I.E.,'36	Pomona, Cal.
Slonaker, Ralph E.	Arts,'35	Nazareth
Smith, Arnold Richard	Ch.E.,'35	Albany, N.Y.
Smith, Arthur Ernest, Jr.	Eng.,'37	Flushing, N.Y.
Smith, Bradford Kimball	Arts,'35	Maplewood, N.J.
Smith, Brennack Biggs	Arts,'37	Interlaken, N.J.
Smith, Charles Richardson	Eng.,'37	Kew Gardens, N.Y.
Smith, Charles Sproat	Bus.,'35	Swarthmore
Smith, Elmer Francis, Jr.	Ch.E.,'35	Roselle Park, N.J.
Smith, Francis John	Arts,'34	Ballston Spa, N.Y.
Smith, Frank Garrettson	Bus.,'36	Upper Montclair, N.J.
Smith, George Ellery Reeve	Bus.,'34	Mineola, N.Y.
Smith, Gerard Leonard	I.E.,'34	Scranton
Smith, Irwin Curtiss	I.E.,'35	Mineola, N.Y.
Smith, Stanton McMasters	M.E.,'36	Montclair, N.J.
Smith, William Moffett, Jr.	Ch.E.,'36	Freehold, N.J.
Smull, Judson Gray, Jr.	Arts,'36	Bethlehem
Snavely, Harry Lichty	Arts,'36	Lampeter
Snow, Herbert Maynard	Eng.,'37	Auburn, Ind.
Snyder, Frederick John	Arts,'37	Mineola, N.Y.
Snyder, George Lloyd, Jr.	Eng.,'37	Somerville, N.J.
Snyder, Milton Ulrich	Phys.,'36	Attica, N.Y.
Snyder, Richard Lee, Jr.	E.E.,'34	Glassboro, N.J.
Sosna, Rudolph Joseph	Bus.,'34	Philadelphia
Spalding, Albert Ruff	Eng.,'37	Fort Humphreys, Va.
Speakman, John Ashbridge	Bus.,'37	Wilmington, Del.
Spengler, Elias Walter	Arts,'36	Bath
Spicher, Smith Ebenezer	E.E.,'35	Indiana
Spohn, Clifford Adams	Arts,'37	Reading
Spooner, Alfred Poole	Arts,'34	East Aurora, N.Y.
Sprague, Kloman Westinghouse	Bus.,'37	Port Nelson, Ont., Canada
Sprague, Luther Samuel	Eng.,'37	Bethlehem
Sprecher, James Leithiser	E.E.,'34	Bethlehem
Squier, Clayton Lindsley	E.E.,'35	Madison, N.J.
Squier, Robert Comey	Eng.,'37	Wenonah, N.J.
Staller, John Russell	E.E.,'36	Schuylkill Haven
Stallings, William Benjamin	Bus.,'35	McKeesport
Standing, Alfred John, Jr.	I.E.,'34	Bethlehem
Stauffer, Howard Israel Josiah	Bus.,'36	Allentown
Stefko, Edward	Arts,'36	Bethlehem
Stein, Donald Cleverly	Arts,'36	East Orange, N.J.
Steinberg, David Mitchell	Arts,'36	Newark, N.J.
Stemler, David Reuben	E.E.,'35	East Mauch Chunk
Stemp, Francis Albert	E.E.,'36	Baltimore, Md.
Stender, Herman Gilbert	C.E.,'34	Scranton
Stenman, Harold Eino	Eng.,'37	Winsted, Conn.
Stern, Albert William	Arts,'37	Hellertown

Stern, Gates Barnet	Arts.,'36	Uniontown
Stevenson, Dean Theodore	Arts,'37	Pottsville
Stewart, Thomas Ronald	Arts,'37	Brooklyn, N.Y.
Stichler, Paul James	Ch.E.,'35	Kutztown
Stiles, Samuel Robert	Ch.E.,'34	Moorestown, N.J.
Stillwell, Frederick, Jr.	Bus.,'36	Huntington, N.Y.
Stobaeus, John Baptist, Jr.	Bus.,'34	South Orange, N.J.
Stockton, Richard Austin	I.E.,'36	Buffalo, N.Y.
Stofflet, Charles Harry	Bus.,'36	Pen Argyl
Stone, Earle, Jr.	Arts,'37	Pelham, N.Y.
Stone, Edward Clinton	Bus.,'37	Montclair, N.J.
Stone, Joseph Knox, Jr.	Met.,'36	Beaver
Stone, Lawrence Edwin	Eng.,'37	Canaan, Conn.
Stopp, Joseph Edward	Eng.,'37	Philadelphia
Story, George Shaw	Bus.,'35	New Rochelle, N.Y.
Stout, Louis Sherwood	Bus.,'36	Irvington, N.J.
Straub, Theodore Alfred, Jr.	I.E.,'34	Canonsburg
Strub, Henry Michael	Ch.E.,'34	Williamsport
Strubhar, Paul Daniel	Met.,'34	Pottstown
Struble, Louis Price, Jr.	M.E.,'35	Westfield, N.J.
Stultz, Frank Paul	Arts,'34	Hollidaysburg
Stupp, Russell William	E.E.,'34	Lemoyne
Stutz, Laurence Oliver	I.E.,'34	Washington, D.C.
Sutton, James Daugherty	Eng.,'37	Indiana
Suvalsky, Matthew	Arts,'34	Malden, Mass.
Swain, Dean Hart	Chem.,'36	Trenton, N.J.
Swalm, John Moffatt, Jr.	Ch.E.,'36	Pottsville
Sweeney, Harold Joseph	Bus.,'34	West Pittston
Swenson, Alvin Augustus, Jr.	Bus.,'37	Philadelphia
Swope, Robert Leibert	I.E.,'35	Washington, D.C.
Taddeo, William	E.E.,'36	Reading
Tanenbaum, Edward Poster	Arts,'36	New Rochelle, N.Y.
Tate, Thomas Edmund	Eng.,'37	Washington, D.C.
Taussig, Elwood Melcher, Jr.	Met.,'36	Philadelphia
Tavormina, Louis	Bus.,'35	Rockville Center, N.Y.
Taylor, Floyd Thomas, Jr.	Bus.,'35	Fairfield, Conn.
Taylor, Norman William	Ch.E.,'36	Allentown
Taylor, Richard Greenleaf	Bus.,'34	Corning, N.Y.
Taylor, Walter Robinson	C.E.,'34	Philadelphia
Terry, Jay Gordon	Eng.,'37	Perkasie
Tether, Joseph Edward	Arts,'34	Hawley
Thalmann, Frederick Edward	Arts,'37	Jersey City, N.J.
Thomas, Alex Brast	Eng.,'37	Huntington, W.Va.
Thomas, David Pryse	Arts,'34	Elmhurst
Thomas, James Gillespie, Jr.	Eng.,'37	Bethlehem
Thomas, John Morgan	Arts,'37	Taylor
Thomas, Karl Parker	Bus.,'35	Taylor
Thomas, Walter Evans	Eng.,'37	Lansford
Thompson, Howard Emil, Jr.	Ch.E.,'36	Westfield, N.J.
Thompson, William Samuel	E.M.,'35	Dover, N.J.
Thomson, Lancey	Bus.,'36	Rahway, N.J.

Thorn, Ernest Wesley	Bus.,'36	Bethlehem
Thropp, William Richard	M.E.,'36	Trenton, N.J.
Tidd, Elbert DeForest	Arts,'37	White Plains, N.Y.
Tiefenthal, Robert Paul	Bus.,'35	New York, N.Y.
Tillapaugh, Herbert James, Jr.	Arts,'37	Binghamton, N.Y.
Tillson, Charles Burritt, Jr.	Eng.,'37	Cochituate, Mass.
Timmons, Claire Henry	Ch.E.,'35	Shenandoah
Tinley, Edward Snyder	E.E.,'35	Allentown
Tobin, Martin John	Eng.,'37	Torrington, Conn.
Todd, Willis Herbert	Bus.,'37	Roselle, N.J.
Toffey, William Vermilye, Jr.	Arts,'35	Jersey City, N.J.
Towle, Charles Lutge	C.E.,'35	Cranford, N.J.
Towne, Harold Earl	Arts,'37	Ossining, N.Y.
Travis, LeRoy Otten	Arts,'35	Great Neck, N.Y.
Trevena, Lewis Wenner	Bus.,'35	Allentown
Trivers, Ira Theodore	Bus.,'36	New York, N.Y.
Troy, Matthew Orpheus, Jr.	E.E.,'36	Schenectady, N.Y.
Truell, Rohn	Phys.,'35	Easton
Trumbore, Franklin Dixson	Phys.,'35	Pleasantville, N.J.
Trumpler, William Ernest, Jr.	Eng.,'37	Easton
Tucker, Barclay Earl	Ch.E.,'35	Forest Hill, Md.
Tupper, John Borden	Arts,'36	Upper Montclair, N.J.
Turnbull, William Gray, Jr.	Eng.,'37	Philadelphia
Turner, Charles Alexander, Jr.	Met.,'34	Ridley Park
Turner, Robert Justice	Bus.,'36	Ridley Park
Tuton, John Walter	Arts,'35	Gillett
Tuttle, Edward Bishop	E.E.,'36	Wilkes-Barre
Twitchell, William Walling	Arts,'35	Trenton, N.J.
Tyler, James Edward, III	Arts,'34	Baltimore, Md.
Uhler, Eugene Hiram	Arts,'37	Bethlehem
Ulak, Brunislaus Stephen	E.E.,'36	Camden, N.J.
Umlauf, Edward William	M.E.,'35	Kulpmont
Upton, Luther Jarius, Jr.	Eng.,'37	Norfolk, Va.
Urken, Karl	Arts,'34	Trenton, N.J.
VanCampen, Ebling Daniell	Bus.,'36	Youngstown, O.
Van Duyne, Gardner	Eng.,'37	Newark, N.J.
Van Scoy, Alfred Davitt, Jr.	E.M.,'35	Bradford
Van Tilburg, Donald Glenn	Eng.,'37	Sussex, N.J.
Vedder, Clifford Wilson	Bus.,'37	Brooklyn, N.Y.
Victory, Homer Jerome	Eng.,'37	Atlantic City, N.J.
Voehl, George Allison	Eng.,'37	Dunellen, N.J.
Vogelsberg, Robert Wilhelm	Eng.,'37	Newark, N.J.
Volkmuth, Albert Roman	Ch.E.,'36	Maplewood, N.J.
Voorhees, Winthrop Dayton	I.E.,'35	Summit, N.J.
Wagman, Francis Christopher	Arts,'35	Dallastown
Wagner, Herbert John	Eng.,'37	Hollis, N.Y.
Wagner, John Aspinwall	Bus.,'37	Newburgh, N.Y.

Wagner, Nelson Whitaker, A.B. *(Princeton University)*	Met.,'35	Wheeling, W.Va.
Wagoner, Richard Henry	C.E.,'36	Carlisle
Waidelich, Donald Long	E.E.,'36	Allentown
Wainright, Henry Vedder	Ch.E.,'34	Manasquan, N.J.
Wait, Harold Vary	M.E.,'34	Houston, Tex.
Walker, Frederick Wiley, Jr.	M.E.,'36	Milwaukee, Wis.
Walker, Lewis, III	Bus.,'36	Meadville
Wall, Alfred Samuel	E.E.,'34	Asbury Park, N.J.
Wallace, Merrill Hornor	Bus.,'37	Keyport, N.J.
Walling, Frank Edward	Met.,'34	Middletown, N.Y.
Walton, Joseph Lewis	Eng.,'37	Pittsburgh
Wantuck, Stephen John	Chem.,'36	Perth Amboy, N.J.
Warinsky, John Vladimir	Eng.,'37	West New York, N.J.
Warmkessel, Carl Andrew	Arts,'36	Allentown
Warner, DeVer Knowlton	Eng.,'37	Bridgeport, Conn.
Warner, Edward Everts	E.E.,'36	Salisbury, Conn.
Warren, Charles Bartlett, Jr.	Arts,'36	Westfield, Mass.
Wascher, Richard Paul	Eng.,'37	London, England.
Watkins, David Oliver	C.E.,'36	Bethlehem
Watkins, Herbert Allen	Eng.,'37	Wilkes-Barre
Watson, Albert Stackhouse	Bus.,'36	Allentown
Watts, Edward Seabrook	Eng.,'37	Greenwich, Conn.
Weaver, Graydon Henry	Bus.,'37	Indianapolis, Ind.
Weaver, Richard Franklin	Arts,'37	Hellertown
Webb, Alfred Mohr	Arts,'35	Allentown
Weber, John Christian	Bus.,'35	Hazleton
Webster, William Henry Clothier	Met.,'34	Philadelphia
Weicker, Raymond William	Arts,'35	Jamestown, R.I.
Weidner, Charles Leslie	Ch.E.,'34	Carlisle
Weigel, Albert Schofield	M.E.,'36	East Orange, N.J.
Weil, William Seligman, Jr.	E.E.,'35	Philadelphia
Weill, Victor	Arts,'34	Mount Vernon, N.Y.
Weimer, Ralph Louis	Ch.E.,'36	Nutley, N.J.
Weinstein, Charles	Eng.,'37	Bloomfield, N.J.
Weinstock, Louis	Arts,'36	Brooklyn, N.Y.
Weiss, Bernard Samuel	C.E.,'36	Philadelphia
Weiss, Dion	E.E.,'35	Jersey City, N.J.
Weitzel, Paul Huber	I.E.,'35	Manheim
Welch, Clarence Benning	Eng.,'37	Brookline
Weldy, George Henry	Eng.,'37	Tamaqua
Weller, Robert Nathan	Eng.,'37	Avoca
Wentz, Charles Brenton	Eng.,'37	Hanover
Werner, Melvin Otto	Bus.,'34	Nazareth
Wesley, Lester Raymond	Eng.,'37	Haddonfield, N.J.
Wheeler, William Sprague	Bus.,'36	New Castle
Whetston, Charles Albert, Jr.	Bus.,'36	Winnetka, Ill.
White, Alonzo, III	Eng.,'37	Matawan, N.J.
White, Charles Meredith	Arts,'37	Mount Vernon, N.Y.

White, William Mansfield	M.E.,'36	Utica, N.Y.
Whitney, Sumner Brown, Jr.	Bus.,'35	Summit, N.J.
Widmer, Kemble	C.E.,'36	Ridgefield, Conn.
Wilder, Paul Cogswell	Eng.,'37	Attica, N.Y.
Wildman, Eugene Lee, Jr.	M.E.,'34	Baltimore, Md.
Wilkens, William John	Bus.,'36	New York, N.Y.
Wilkinson, William Christopher, Jr.	Eng.,'37	Dayton, O.
Williams, Daniel Bemis	Bus.,'37	Minneapolis, Minn.
Williams, Edwin Samuel, Jr.	M.E.,'35	Mount Vernon, N.Y.
Williams, Howard Switzer	I.E.,'35	Summit, N.J.
Williams, John Joseph	Ch.E.,'34	Bethlehem
Williams, John Roger	Bus.,'35	Philadelphia
Williams, Miller	I.E.,'34	Philadelphia
Williams, Raymond Everett	Eng.,'37	Summit, N.J.
Williams, William Rendell, Jr.	C.E.,'36	Philadelphia
Wilson, Fred, Jr.	C.E.,'35	Reisterstown, Md.
Wilson, James Murray Russell	Bus.,'36	Philadelphia
Wilson, Richard MacDonald	M.E.,'35	Pitman, N.J.
Wilson, Verne Rumbaugh	M.E.,'36	Wilmington, Del.
Wilson, Walter Edward	Arts,'36	Brooklyn, N.Y.
Winblad, Wilbur Carl	Bus.,'34	Brooklyn, N.Y.
Winco, Lawrence Anton	I.E.,'36	Philadelphia
Winger, Richard Leber	M.E.,'36	Merion
Winship, Benjamin Wesco, Jr.	Eng.,'37	Orchard Park, N.Y.
Winterbottom, Arthur William	Eng.,'37	Bayside, N.Y.
Winters, Frank Thomas, Jr.	Eng.,'37	Amityville, N.Y.
Wiswesser, William Joseph	Ch.E.,'36	Reading
Witmer, Benjamin Franklin	C.E.,'34	Lancaster
Wolcott, George Linton	Arts,'34	Red Bank, N.J.
Wolcott, Mark Walton	Arts,'37	Mansfield, O.
Wolf, Lawrence Paul	Arts,'37	Brooklyn, N.Y.
Wolf, Meyer	E.M.,'35	New York, N.Y.
Wolf, William Robert	Bus.,'36	Little Neck, N.Y.
Woodring, William Boone	Ch.E.,'36	Bethlehem
Woronoff, Herbert	Arts,'37	Port Chester, N.Y.
Woronoff, William	Arts,'37	Port Chester, N.Y.
Wright, Douglas Chandler	Bus.,'37	Upper Montclair, N.J.
Wright, James Robert	Arts,'34	Philadelphia
Wright, Samuel Bolling, Jr.	Eng.,'37	Mexico City, Mex.
Wyatt, John Raymond	Arts,'35	Martinsville, N.J.
Wyman, Herbert George	Bus.,'35	Glen Ridge, N.J.
Yeager, Charles Henry	Eng.,'37	West Hartford, Conn.
Yanko, George	Arts,'37	Red Bank, N.J.
Yates, Donald Curtis	Bus.,'35	White Plains, N.Y.
Yerrick, Charles Rush, Jr.	Bus.,'34	Scranton
Yewdall, George Edward	Eng.,'37	Philadelphia
Yotter, Richard Kinsey	Bus.,'34	Easton
Young, Herbert Alwin	Arts,'37	Merion
Young, William Crooks	Bus.,'37	Williamsport
Youngerman, Abraham Arnold	Arts,'35	New York, N.Y.

Zacharias, Edward E., Jr.	C.E.,'36	Philadelphia
Zawatski, Chester Anthony	Eng.,'37	Kingston
Zettlemoyer, Albert Charles	Ch.E.,'36	Allentown
Zimmerman, David Albright	Bus.,'35	Flushing, N.Y.
Zimmerman, William Adam	Arts,'37	Lancaster
Zuckerman, Albert	Bus.,'34	Philadelphia
Zumeta, Julio, Jr.	I.E.,'35	Havana, Cuba

SPECIAL STUDENTS

Buerschaper, Robert August	E.E.	Bethlehem
Cooper, Earl Purnell	M.E.	Coopersburg
Heffner, Stanley Frederick	Arts	Bethlehem
Jackson, Edward Hayward	I.E.	West Lawn
Jacobs, Gerald Bert	M.E.	Emaus
Keen, Benjamin	Arts	Bethlehem
Krack, Ernest Edward	C.E.	Brooklyn, N.Y.
Thompson, Mitchell Alexander	Ch.E.	Bethlehem
Woodsum, Edmund Nugent	Bus.	Allentown
Zeigler, Paul Philip	Met.	York

SUMMER SESSION, 1933

Adamson, John Howard	Meyersdale
Aicher, Edward Franklin	Easton
Alexander, Jay Lewis	Pittston
Allen, Charles Barnett	Philadelphia
Allison, Robert Price, Jr.	Schenectady, N.Y.
Ambruster, Watson, III	Westfield, N.J.
Anamisakis, Anthony Fotis	Bethlehem
Anderson, Judith, Ph.B. *(Muhlenberg College)*	Bethlehem
Antrim, William Drown, Jr.	Gloucester, N.J.
Aoki, Kertrude Steelman	Bethlehem
Aucott, William Connery	Philadelphia
Austin, William Edward	Maplewood, N.J.
Bailey, Albert Tanner, Jr.	Montclair, N.J.
Baillie, John William	Bethlehem
Balliet, Claude Samuel	Catasauqua
Baxter, Malcolm Hume	New York, N.Y.
Bayer, Curtis Frederick Anselem	Scarsdale, N.Y.
Beal, Thomas James	Meyersdale
Beatty, Kenneth Orion	Drexel Hill
Benner, Harry Lester	Lederach
Bentz, Russell Herman	York
Berman, Morton	Norrristown
Bewley, Frank Wilson	Pottstown
Beyer, Arnold John	Allegany, N.Y.
Bigelow, Claude Illingsworth	Rockville Center, N.Y.
Bilger, Walter Gibson	Philadelphia
Black, Lewis Charles	Gloucester, N.J.
Blass, Lamar Kostenbauder	Aristes
Bleam, Althea Gertrude, A.B. *(Cedar Crest College)*	Allentown
Bleuit, Frederick Storey	Philadelphia
Blessing, Ruth Elizabeth	Bethlehem
Blythe, Ralph Masland	Philadelphia
Bock, Charles Frederick	Caldwell, N.J.
Boden, Marston Hall	Flushing, N.Y.
Bonkemeyer, Amos Colbert, Jr.	Greensboro, N.C.
Bonnett, Horace Wilson	Aberdeen, Md.
Bowden, George Smith	Nutley, N.J.
Branda, Richard Randolf	Hamilton, Ont., Canada
Branegan, James Augustus, Jr.	Drexel Hill
Brant, Irvin Longaker	Norristown
Brewer, Leonard	Delaware Water Gap
Brisker, Sidney Hirsch, II	Bethlehem
Brodhead, Woodruff Martin	Elizabeth, N.J.
Brooks, Harold Taylor	Upper Montclair, N.J.
Brown, Franklin James, B.S. *(Moravian College)*	Bethlehem
Brown, Joseph Francis	Lyndhurst, N.J.

Brown, Ralph Wilson	Plainfield, N.J.
Buchanan, Robert Williams	Maplewood, N.J.
Buck, Richard Benn	Williamstown, N.J.
Bugbee, Charles Kendall	Trenton, N.J.
Bullard, Joseph William Camp, Jr.	Southport, Conn.
Butterfield, John Parker	Bethlehem
Butz, George Alpha	Schuylvill Haven
Calahan, William James, Jr.	East Orange, N.J.
Calhoun, Lawson Peel	Atlanta, Ga.
Campbell, William Francis, Jr.	Nyack, N.Y.
Canfield, William Benjamin	Caldwell, N.J.
Carhart, Gregory	Springfield, Mass.
Chapin, Henry Merritt	Flushing, N.Y.
Chapman, Alfred George	Carbondale
Chickering, Edwin Shepard	Oil City
Clarke, Jess Fellows	Buffalo, N.Y.
Cliver, Gordon Lawrence	Tottenville, N.Y.
Close, Courtney Taft	Dunmore
Clow, Wesley Ludlon	Pine Castle, Fla.
Colbaugh, Robert Crawford, Jr.	Wilkinsburg
Colitz, Michael John	Pottsville
Connelly, John Robert, B.S. in M.E., M.S. *(University of Illinois)*	Bethlehem
Conroy, William Joseph	Philadelphia
Cook, William Franklin	Sylvan
Cooley, Charles Freeland	Pennington, N.J.
Cooper, Donald Treat	Philadelphia
Cooper, Lloyd Ryder	Coopersburg
Couch, Robert deSchweinitz	Bethlehem
Coulter, William Smeltz	Lancaster
Coventry, John Roberts	Hibbing, Minn.
Craft, Norman Willet	Cedarhurst, N.Y.
Crockett, Walter Prentice	Lancaster
Croll, Arthur	Buffalo, N.Y.
Cummings, Vail William	Maplewood, N.J.
Curtis, Roger Sumner	Devon
Custer, Robert Hutchinson	Mount Vernon, N.Y.
Daddow, Theodore R., Jr.	Pottsville
Davenport, Theodore	Netcong, N.J.
David, David Gabriel	Philadelphia
Davis, William Robert	Lansford
deBerardinis, Vincent Anthony	Chester
DeForeest, Edward Tucker	Newark, N.J.
Deily, Robert Howard, A.B., B.S. in L.S. *(Muhlenberg College, Columbia University)*	Bethlehem
DeKay, Miner Delmont	Mountain Home
deNavarvaez, Charles Agustin	Bogota, Colombia
DePuy, Edward DeWitt	Brooklyn, N.Y.
Derrico, Charles	New York, N.Y.

Dickerson, Randal Levin	Laurel, Del.
Dickinson, Joseph R., Jr.	Reading
Downing, Robert Edward	Hudson, N.Y.
Duke, William Harrison	Corning, N.Y.
Dunlap, William Berger	Pittsburgh
Eby, Martin Christian	New Holland
Eckles, Charles Cook	New Castle
Edwards John Beitel	Bethlehem
Ehmann, Neville Howell	Brookline
Eichelberger, Lewis Hay	Eagle Pass, Tex.
Eichner, Robert Mills	Upper Montclair, N.J.
Ellison, Stanley Russell	South Orange, N.Y.
Enscoe, Roger	Port Washington, N.Y.
Ertle Lawrence Joseph	Pittsburgh
Escobedo, Gilberto	Mexico City, Mex.
Evans, David Daniel	Scranton
Evans, Foster William	Reading
Fairer, Stanley Bush, B.S. *(Lafayette College)*	Easton
Farnsler, Herbert Forrest	Harrisburg
Fay, Joseph Edmund	West Pittston
Fehr, Harold George	Pen Argyl
Ferry, John Jude	Bethlehem
Fink, Lawson Jeremiah, A.B. *(Muhlenberg College)*	Albany
Fisher, William Wallace, Jr.	Orange, N.J.
Foering, Howard Augustus Jr.	Bethlehem
Folkner, Maurice Harvey	Buttzville, N.J.
Ford, Charles Harry	Forest Hills, N.Y.
Ford, Howard Holmes, Jr.	Ridgewood, N.J.
Fouse, Donald Weber	Harrisburg
Fox, Beauvais Baugh, Jr.	New York, N.Y.
Frauenfield, Lewis Jacob	Topton
Freed, Howard Biehn	Quakertown
Frick, John Arthur, Jr.	Allentown
Friedel, Warren Wien	Philadelphia
Fuller, James Osborn	Bethlehem
Fuller, Merton Otis, C.E. *(Syracuse University)*	Bethlehem
Furman, Millard Robert	Newark, N.J.
Gallagher, Charles Edward	New York, N.Y.
Gallagher, Edward Spring	Great Neck, N.Y.
Gallaher, Howard Scott	Trenton, N.J.
Gavin, John Daniel	Catasauqua
Geehr, Homer Pyle	Quincy, Mass.
Genszler, William G., Ph.B. *(Muhlenberg College)*	Allentown
George, Henry Peter	Palmerton
Gibbs, Howard Arthur, Jr.	Jersey City, N.J.
Glading, Alfred Decatur, Jr.	Haddonfield, N.J.
Glassford, Donald Carson	Baltimore, Md.

Godfrey, Norman Maitland	Bassaic, N.J.
Godshall, William Herbert	Lansdale
Goldsmith, Poe Tennyson Longfellow	Catasauqua
Graeff, William Harm	Hershey
Gray, Thomas Douglas Lloyd	Marlborough, N.Y.
Greene, Thomas Frederick	Easton
Grimwood, James Edward	Allentown
Groff, William Ellsworth	Easton
Gummere, William, Jr.	Trenton, N.J.
Hackett, John Vincent	Riverton, N.J.
Hahn Mary Elizabeth	Bath
Hartman, Dorothy June	
Hartmann, Theodore Frederick	Bethlehem
Haulenbeek, Garrie Beazley	Bound Brook, N.J.
Haupt, Harry Crickard, Jr	York
Hayman, Richard Homer	Racine, O.
Healy, Dudley Loveland	Chatham, N.J.
Healy, Thomas Joseph	Bala-Cynwyd
Heath, Edwin Clifford	Bethlehem
Heiberger, Charles Adam	Allentown
Heid, George Joseph, Jr.	Freemansburg
Helms, Samuel Britton	Philadelphia
Herbert, Sidney Pembroke	Upper Montclair N.J.
Herron, Perry Marvin	New York, N.Y.
Hertel, Charles Clement, Jr.	Ridgewood, N.J.
Hickok, Daniel Hastings, Ph.B. *(Yale University)*	Harrisburg
Hildenberger, Martin Joseph, Jr.	Bethlehem
Hill, Harry Logan	Baltimore, Md.
Hilpert, John Meier	Bethlehem
Hilpert, Myra Emma	Bethlehem
Hinkle, Harold Eugene	Bethlehem
Hocking, John Girvin	Lancaster
Holler, Henry Greve	Rockville Centre, N.Y.
Holmes, Lawrence John, Jr.	Allentown
Holton, Frances Hershey	Bethlehem
Hoppock, David Willard	Maplewood, N.J.
Horlacher, George Appel	Allentown
Hottenstein, John Mahlon	Allentown
Howells, George Benjamin	Hanover
Hoyt, Jack Garland	Berwick
Hulick, Charles Edwin, Jr.	Easton
Hurford, Winslow Leroy	Neptune, N.J.
Illick, Montford Elroy, B.S. *(Lafayette College)*	Hellertown
Jauck, Walter Milton	Woodhaven, N.Y.
Jones, Doris Lyston	Easton
Kampshulte, Robert Henry	Farmingdale, N.Y.
Kaufmann, Emerson Wertz, B.S. in Ch.E. *(Lehigh University)*	Wyomissing

Keat, Donald Bonney, B.S. *(Lafayette College)*	Bangor
Keen, Benjamin	Bethlehem
Kennedy, Henry Clay, Jr.	Harrisburg
Kerst, Orum Roehrer	Jersey City, N.J.
Kildare, Vernon Albert	Bethlehem
Kildebo, Howard Martin	Hazleton
King, Donald Milton	Norristown
Kinney, Arthur George, Jr.	Janison
Klausmann, Milton Harry	Maplewood, N.J.
Klein, Charles Anthony	Allentown
Klingaman, George W.	Lynnport
Klingaman, Lloyd Kistler	Emaus
Klotz, Russel Richard, B.S. *(Muhlenberg College)*	Sheridan
Knauss, Albert Roland	Nazareth
Knipe, Vincent Arthur	Bethlehem
Kohler, Stanley Maurice	Bloomfield, N.J.
Koman, Michael	Fogelsville
Kotanchik, Nicholas Walter	Ranshaw
Kozak, Walter Harry	Shamokin
Krack, Ernest Edward	Brooklyn, N.Y.
Kraemer, John Jacob	Pottsville
Kress, John Harner	Pittsburgh
Krebel, Denton Henry, Ph.B. *(Muhlenberg College)*	Lynnville
Krusius, Ewald Henry	Weehawken, N.J.
Kuehner, Arlyle Kathleen, B.A. *(Moravian College for Women)*	Bethlehem
Kuhl, Frederick August	Allentown
Lafferty, Isabel Morrison, A.B. *(Oklahoma City University)*	Bethlehem
Lane, John Wilson	Newton, N.J.
Langdon, Palmer Hull, Jr.	Brooklyn, N.Y.
Lark, Frederick Emanuel	Shamokin
Lauer, Franklin Richard	Lansford
Lawlar, John Bovaird	Chester
Lawton, Irving Lester	Olcott, N.Y.
Layman, Ralph Earl, Jr.	Red Bank, N.J.
Leitner, Frederick, B.A. *(Lehigh University)*	Bethlehem
Lengel, Robert Charles	Bryn Mawr
Lenna Reginald Alexander	Jamestown, N.Y.
Linton, Thomas	Palmerton
Lisle, John	Paoli
Lloyd, Elbert Stevens	Wilkes-Barre
Lloyd, John Armon	Wilkes-Barre
Long, Austin Kunsman	Freemansburg
Lotz, William Fredercik, Jr.	Philadelphia
Loux, Arthur Henry	Newark, N.J.
Lowright, Raymond Charles	Bethlehem

Lucas, Blanche Wingert, B.S. *(New York University)*	Allentown
Lutz, Curwen William	Perkasie
Lyman, Edwin Smith, Jr.	Yonkers, N.Y.
MacGuffie, James	Orange, N.J.
Mack, Edith L.	Bethlehem
Maguire, Kenneth Faust	Mahonoy City
Male, John Medland	Brooklyn, N.Y.
Manheimer, Sanford Hirsh	Lancaster
Maratta, William Zimmerly	Coraopolis
Marks, Robert Edwin	Allentown
Marshall, Erwin Ellsworth, Jr.	Trenton, N.J.
Marshall, William Don	Camden, N.J.
Martin, Harry Charles Coakley	Glen Rock, N.J.
Martin, William Stockton, Jr.	Stratford, N.J.
Masters, Donald Smith	Pittston
Matesky, Solomon Joseph	Bethlehem
Maynard, William Benz	Paterson, N.J.
McArdle, John James	Havana, Cuba
McAusland, John Randolph	Skytop
McCabe, Joseph Charles	Plainfield, N.J.
McCarty, Charles Allen	Bethlehem
McConahey, Hugh Milner	Wilkinsburg
McHose, Charles Albert	Hazleton
McKeone, Charles Joseph	Allentown
McNeal, John, III	Easton
Meihofer, Anthony Rudolph	Allentown
Meissner, Milton	Plainfield, N.J.
Merriam, William Rush	Washington, D.C.
Mertens, Fred Meharg	Asbury Park, N.J.
Metzger, Esta Eleanor, Ph.B. *(Muhlenberg College)*	Allentown
Meyer, Albert Henry	Jersey City, N.J.
Miller, Anna Kathrine	Allentown
Miller, Clinton Fred	Berwick
Miller, Harold Yack	Lyndhurst, N.J.
Miller, Helen Dorothy, A.B. *(Moravian College for Women)*	Bethlehem
Miller, Marlin Charles	Donaldson
Miller, Nathan	Bethlehem
Miller, Walter Samuel	California
Milliken, Thomas Henry	Pittsburgh
Mills, Ivor William	Wyoming
Minnich, Charles Franklin	West Lawn
Mintz, Gerald Emanuel	Allentown
Morrison, Arthur Victor	Ridgefield Park, N.J.
Morrison, George Ronald	Minersville
Morse, John Alfred	Scranton
Mozes, Adolph	Allentown
Mumbauer, Eleanore Dengler, B.A. *(Moravian College for Women)*	Bethlehem

Munzer, Maurice Herbert	New York, N.Y.
Musselman, Casper Rosenstock	Bethlehem
Neiman, William Robert	Philadelphia
Nissler, Leonara Martha	Bethlehem
Nivin, David Traver	Bethlehem
Nonnemaker, Warren Francis, B.A. *(Moravian College)*	Bethlehem
Nutt, Walter Frederick, Jr.	Clifton, N.J.
Ohmer, Paul Herman	Ridgewood, N.J.
Opie, John Vredenberg	Neshanic, N.J.
Oskin, William Walker	Bethlehem
Osterhoudt, Lawrence Jan	New Paltz, N.Y.
Palmer, Carl Pfeiffer	Bethlehem
Parmet, Bessie, B.A. *(Cedar Crest College)*	Allentown
Paternoster, Joseph Albert	Trenton, N.J.
Patten, Alex Stevens	Ridgewood, N.J.
Paulsen, Edgar Peter, B.S. *(Moravian College)*	Lehighton
Payrow, Harry Gordon, B.S. in C.E. *(Tufts College)*	Bethlehem
Pearson, Philip Dawson	Wilkes-Barre
Pease, Robert Horton	Rochester, N.Y.
Pedrick, George James	Cold Spring Harbor, N.Y.
Pelizzoni, Winton John	Allentown
Perrine, Robert Hutchinson	Bloomfield, N.J.
Pfaff, Henry Carl, Jr.	East Orange, N.J.
Phillips, Andrew Nesbitt	Morristown, N.J.
Picking, Robert Boyd	Somerset
Pierson, Frank Kenneth	Washington, D.C.
Pisarev, David Connells	Bethlehem
Porter, Waldo, Jr.	Greensboro, N.C.
Potter, Charles Beattie	Washington, D.C.
Pratt, Thomas Willard	Jersey City, N.J.
Preston, Paul Franklin	Bethlehem
Provost, Richard Whitehead	Caldwell, N.J.
Prowell, Roy Walters	Steelton
Puffer, Hal Everest	Buffalo, N.Y.
Quakenbush, Cornelius Bogert	Hackensack, N.J.
Quinn, Thomas Stephen	Bethlehem
Rae, Morton Black	West Newton, Mass.
Reichard, Roneva E. A.	Allentown
Reis, Robert	New York, N.Y.
Replogle, Charles Nathan, Jr.	Johnstown
Retzer, William Raymond	Deposit, N.Y.
Reul, Raymond Insel	Roselle, N.J.
Reynolds, Jane Nibloch	Bethlehem
Reynolds, Peter Graham, B.S. in M.E. *(Lehigh University)*	Bethlehem
Reynolds, Thomas Bernard	Phillipsburg, N.J.

Rimmer, Donald Cyril	Philadelphia
Roberts, Lewis, Jr.	Fairfield, Conn.
Roberts, Paul Taylor.	Westfield, N.J.
Rogers, Gilbert Dwight	Big Stone Gap, Va.
Rogers, Wayne Carlton	Kingston
Roper, John Nathaniel, Jr.	Petersburg, Va.
Rosebery, Hugh John	West Haven, Conn.
Ruffle, Leslie	Queen's Village, N.Y.
Samuels, David Griffith, Jr.	Bethlehem
Sasse, Ralph Warren	New York, N.Y.
Savastio, James Dominic	Hershey
Sayer, William Hallock, Jr.	Warwick, N.Y.
Schadt, Elizabeth Heilman	Fullerton
Schaeffer, Judson	Bethlehem
Schaffer, Elwood Joseph	Bath
Schappel, Joseph William	Allentown
Scharfenberg, Chatwin Ambrose	East Rockaway, N.Y.
Schenk, Everett Milford	Summit, N.J.
Schlenker, Henry Walter, Jr.	Elizabeth, N.J.
Schmoyer, Fhederick Peter	Allentown
Scholl, Harold Nevin	Souderton
Schwarze, Margaret E.	Winston-Salem, N.C.
Scott, Wilson Winfield, Jr., E.E. *(Lehigh University)*	Catasauqua
Secor, Sanford A., B.S. *(Stroudsburg State Teachers College)*	Catasauqua
Settle, Paul Smith, Jr.	Drexel Hill
Seybold, Arthur Mack	Elkins Park
Shackford, Charles Chauncey	Jamestown, R.I.
Shafer, David Woodrow	Bethlehem
Shafer, Montgomery Rea, Jr.	Chevy Chase, Md.
Sharpe, Fred Lawrence	Ridgefield Park, N.J.
Shepard, Harvey Mortimer	Madison, N.J.
Shimer, Acton Jerome	Bethlehem
Shipp, Harry Benedict	Bethlehem
Siegel, Henry Auerbach	New York, N.Y.
Silverberg, Nathan	Bethlehem
Smith, Arnold Richard	Albany, N.Y.
Smith, Charles Richardson	Kew Gardens, N.Y.
Smith, Elemer Francis, Jr	Roselle Park, N.J.
Smull, Judson Gray, Jr.	Bethlehem
Spalding, Albert Ruff	Webster Groves, Mo.
Spicher, Smith Ebenzer	Indiana
Squier, Clayton Lindsley	Madison, N.J.
Steadman, Christopher, Jr.	Staten Island, N.Y.
Stein, Donald Cleverly	East Orange, N.J.
Stichler, Paul James	Kutztown
Stiles, Samuel Robert	Moorestown, N.J.
Stofan, Andrew John, B.A. *(Lehigh University)*	Freeland
Stopp, Joseph Edward	Philadelphia

Straub, Theodore Alfred, Jr.	Canonsburg
Strouse, Anna Malinda	Bethlehem
Strub, Henry Michael	Williamsport
Struble, Louis Price, Jr.	Westfield, N.J.
Stupp, Russell William	Lemoyne
Swain, Dean Hart	Trenton, N.J.
Swalm, John Moffatt, Jr.	Pottsville
Swope, Robert Leibert	Washington, D.C.
Taddeo, William	Reading
Taussig, Elwood Melcher, Jr.	Philadelphia
Thomas, Karl Parker	Taylor
Thomas, Walter Evans	Lansford
Thompson, William Samuel	Dover, N.J.
Thropp, William Richard	Trenton, N.J.
Timmons, Claire Henry	Shenandoah
Towle, Charles Lutge	Cranford, N.J.
Trembley, Francis John, B.S., M.S. *(Hobart College, Lehigh University)*	Bethlehem
Troy, Matthew Orpheus, Jr.	Schenectady, N.Y.
Truell, Rohn	Easton
Tucker, Barclay Earl	Forest Hill, Md.
Tuttle, Edward Bishop	Wilkes-Barre
Umlauf, Edward William	Kulpmont
VanScoy, Alfred Davitt, Jr.	Bradford
Victory, Homer Jerome	Atlantic City, N.J.
Voehl, George Allison	Dunellen, N.J.
Waidelich, Donald Long	Allentown
Walker, Frederick Wiley, Jr.	Milwaukee, Wis.
Warner, Edward Everts	Salisbury, Conn.
Wassum, Harry Melvil	Canonsburg
Watkins, David Oliver	Bethlehem
Watkins, Herbert Allen	Wilkes-Barre
Watkins, Thomas William	Coopersburg
Weidner, Charles Leslie	Carlisle
Weigel, Albert Schofield	East Orange, N.J.
Weimer, Ralph Louis	Nutley, N.J.
Weiss, Bernard Samuel	Philadelphia
Weitzel, Paul Huber	Manheim
Weldy, George Henry	Tamaqua
Wheeler, William Sprague, Jr.	New Castle
White, William Mansfield	Utica, N.Y.
Widmer, Kemble	Ridgefield, Conn.
Wilder, Paul Cogswell	Attica, N.Y.
Williams, Benjamin Crispen, Ph.B. *(Lafayette College)*	Catasauqua
Williams, John Joseph	Bethlehem
Williams, William Rendell, Jr.	Philadelphia
Wilson, Muriel Louise, A.B., M.A. *(Moravian College for Women, Lehigh University)*	Bethlehem
Wilson, Richard MacDonald	Pitman, N.J.
Wilson, Verne Rumbaugh	Wilmington, Del.

Winco, Lawrence Anton	Philadelphia
Wiswesser, William Joseph	Reading
Wolf, Meyer	New York, N.Y.
Woodrich, Frederick William	Minneapolis, Minn.
Woodring, William Boone	Bethlehem
Wright, James Robert	Philadelphia
Yeakel, Eleanor Hugins *(Bryn Mawr College)*	Bethlehem
Yons, Evelyne Roberta	Hellertown
Young, George McAlpine	Cumberland, Md.
Zacharias, Edward E., Jr.	Philadelphia
Zalinski, Edmund Louis Gray	Salt Lake City, Utah
Zeigler, Paul Philip	York
Zimmerman, David Albright	Flushing, N.Y.
Zuckerman, Albert	Philadelphia
Zumeta, Julio, Jr.	Havana, Cuba

SUMMARY OF STUDENTS BY CLASSES AND CURRICULA

Undergraduates	Seniors	Juniors	Sophomores	Freshmen	Special Students	Total
Arts and Science	51	50	60	82	2	245
Business Administration	78	71	80	91	1	321
Chemical Engineering	30	40	47	......	1	118
Chemistry	6	5	9	......	....	20
Civil Engineering	17	15	22	......	1	55
Electrical Engineering	22	20	32	......	1	75
Engineering Physics	1	9	4	......	....	14
Industrial Engineering	27	27	27	......	1	82
Mechanical Engineering	13	19	35	......	2	69
Metallurgical Engineering	18	10	13	......	1	42
Mining Engineering	12	8	6	......	....	26
Freshman Engineering	......	......	......	270	....	270
Total	275	274	335	443	10	1337

Graduate Students	120
Undergraduate Students	1337
Students in Summer Session	439
Total, less duplications	1543

GEOGRAPHICAL DISTRIBUTION OF STUDENTS, 1933-34

Alabama	1
California	1
Connecticut	32
Delaware	14
District of Columbia	19
Florida	2
Georgia	1
Illinois	5
Indiana	4
Maryland	22
Massachusetts	19
Minnesota	2
Missouri	1
New Jersey	398
New York	260
North Carolina	2
Ohio	15
Oklahoma	1
Pennsylvania	708
Rhode Island	4
Texas	2
Virginia	6
Washington	1
West Virginia	8
Wisconsin	3
Canada	1
Canal Zone	1
Colombia	3
Cuba	4
England	1
Mexico	2
	1543

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